National Advisory Committee for Aeronautics

Research Abstracts

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CURRENT NACA REPORTS

NACA Rept. 1135

EQUATIONS, TABLES, AND CHARTS FOR COMPRESSIBLE FLOW. Ames Research Staff. 1953. iii, 69p. diagrs., 25 charts, 2 tabs. (NACA Rept. 1135. Formerly TN 1428)

This report, which is a revision and extension of TN 1428, presents a compilation of equations, tables, and charts useful in the analysis of high-speed flow of a compressible fluid. The equations provide relations for continuous one-dimensional flow, normal and oblique shock waves, and Prandtl-Meyer expansions for both perfect and imperfect gases. The tables present useful dimensionless ratios for continuous one dimensional flow and for normal shock waves as functions of Mach number for air considered as a perfect gas. One series of charts presents the characteristics of the flow of air (considered a perfect gas) for oblique shock waves and for cones in a supersonic airstream. A second series shows the effects of caloric imperfections on continuous one-dimensional flow and on the flow through normal and oblique shock waves.

NACA Rept. 1153

ON THE APPLICATION OF TRANSONIC SIMILARITY RULES TO WINGS OF FINITE SPAN. John R. Spreiter. 1953. ii, 21p. diagrs. (NACA Rept. 1153. Formerly TN 2726)

The transonic aerodynamic characteristics of wings of finite span are discussed from the point of view of a unified small perturbation theory for subsonic, transonic, and supersonic flows about thin wings. This approach avoids certain ambiguities which appear if one studies transonic flows by means of equations derived under the more restrictive assumption that the local velocities are everywhere close to sonic velocity. The relation between the two methods of analysis of transonic flow is examined, the similarity rules and known solutions of transonic flow theory are reviewed, and the asymptotic behavior of the lift, drag, and pitching-moment characteristics of wings of large and small aspect ratio is discussed. It is shown that certain methods of data presentation are advantageous for the effective display of these characteristics.

NACA TM 1374

KINETIC TREATMENT OF THE NUCLEATION IN SUPERSATURATED VAPORS. (Kinetische Behandlung der Keimbildung in ubersattigten Dampfen). R. Becker and W. Döring. September 1954. 43p. diagrs. (NACA TM 1374. Trans. from Annalen der Physik, Ser. 5, v. 24, 1935, p. 719-752).

The equations of the individual processes of self nucleation are utilized through an electrical analogy to obtain the nucleation frequency. This process is shown to be shorter and less subject to error than that of previous investigators since the appearance of indeterminant integration constants is completely avoided. With the nucleation frequencies of crystals and spheres the Ostwald law of stages is reviewed and modified. In the final section the general resistance image is discussed and mention is made of the relation of the electrical network and Volmers formula.

NACA TN 3199

STRESS DISTRIBUTIONS CAUSED BY THREE TYPES OF LOADING ON A CIRCULAR SEMIMONOCOQUE CYLINDER WITH FLEXIBLE RINGS. Harvey G. McComb, Jr. September 1954. 54p. diagrs. (NACA TN 3199)

Equations are derived for the stress distributions caused by three types of loading on infinitely long, circular, semimonocoque cylinders with flexible rings. The results are given as formulas for the stringer loads and shear flows in the shell due to each type of loading. For each loading case these formulas can be used to construct tables of influence coefficients giving stringer loads and shear flows in the neighborhood of the load due to a unit magnitude of that load.

NACA TN 3231
National Advisory Committee for Aeronautics.
BENDING TESTS ON BOX BEAMS HAVING SOLID- AND OPEN-CONSTRUCTION WEBS. Aldie E. Johnson, Jr. August 1954. 25p. diagrs., photos., 2 tabs. (NACA TN 3231)

The results of an exploratory experimental investigation of the effects of replacing alternate webs in a multiweb beam by open, post-stringer construction are reported. Post-stringer (either upright or inclined posts) construction is shown to perform the function of comparable-weight, solid, fabricated webs in the stabilization of the compression cover of a beam in bending both before and after buckling.

NACA TN 3235
National Advisory Committee for Aeronautics.
LOW-SPEED YAWED-ROLLING AND SOME OTHER ELASTIC CHARACTERISTICS OF TWO 56-INCH-DIAMETER, 24-PLY-RATING AIRCRAFT TIRES. Walter B. Horne, Bertrand H. Stephenson and Robert F. Smiley. August 1954. 108p. diagrs., photos., 6 tabs. (NACA TN 3235)

The low-speed (up to 4 miles per hour) cornering characteristics of two 56 x 16, type VII, extra-high-pressure, 24-ply-rating tires were determined for a range of vertical loadings, yaw angles, and tire inflation pressures. Locked-wheel drag tests were also made for one vertical load condition. The quantities measured included cornering force, drag force, self-alining torque, pneumatic caster, vertical tire deflection, rolling radius, and relaxation length. Some supplementary tests were made which included measurements of tire footprint area, vertical-load-deflection characteristics, and the variation of tire radius and width with inflation pressure.

NACA TN 3303

TURBULENT-HEAT-TRANSFER MEASUREMENTS AT A MACH NUMBER OF 3.03. Maurice J. Brevoort and Bernard Rashis. September 1954. 21p. diagrs., tab. (NACA TN 3303)

A three-dimensional axially symmetric plug nozzle was used to obtain flat-plate data on turbulent-heat-transfer coefficients and recovery factors. The test results of this paper are for Mach number 3.03 and for a Reynolds number range of 5.6×10^6 to 6.5×10^7. The heat-transfer-coefficient results are in good agreement with theoretical analyses and the recovery-factor results are in good agreement with extrapolations of lower Reynolds number data.

MISCELLANEOUS

N-22929

Advisory Group for Aeronautical Research and Development. DIFFUSION FLAMES IN THE LABORATORY. John Barr. March 1954. 10p. diagrs. (Advisory Group for Aeronautical Research and Development. AG11/M7)

A survey of five recent reviews of diffusion flames is given. All the flames discussed are related to each other or can be obtained in a similar burner by varying the fuel type, the fuel and air flows or the static pressure. This survey tended to emphasize our lack of knowledge and the need for further research concerning the factors governing the structure, length and occurrence of diffusion flames.

UNPUBLISHED PAPERS

N-13524*

EXPERIMENTAL INVESTIGATION OF ICING PHENOMENA. (Experimentelle Untersuchung von Vereisungserscheinungen) Domenic Melcher. April 1954. 36p. diagrs., photos. (Trans. from Zeitschrift fur angewandte Mathematik und Physik, v. 2, no. 6, 1951, p. 421-443)

An examination is made of the mechanism of icing phenomena. Artificial rime deposits of various types were produced and measurements made to establish the quantitative dependence of the deposit on temperature, H_2O-content, wind speed, and material of the body to be iced. The growth of the rime on metallic surfaces was observed under the polarizing microscope. An arrangement is described for studying rime in the open air, the purpose of which was to discover whether natural icing is a result of temperature effects. In addition, the influence of the electric field on the type of deposit was examined and measured.

DECLASSIFIED NACA REPORTS

THE FOLLOWING REPORTS HAVE BEEN DECLASSIFIED FROM CONFIDENTIAL, 8/23/54

RM L9K23
RM L50B24a
RM L50C21a
RM L50D04
RM L50F28

THE FOLLOWING REPORTS HAVE BEEN DECLASSIFIED FROM CONFIDENTIAL, 8/31/54

RM A51B14
RM L50J05a
RM L51A08

NACA RM A6G24

THE SUBSONIC AERODYNAMIC CHARACTERISTICS OF TWO DOUBLE-WEDGE AIRFOIL SECTIONS SUITABLE FOR SUPERSONIC FLIGHT. Joseph Solomon and Floyd W. Henney. May 12, 1947. 33p. diagrs., photos. (NACA RM A6G24) (Declassified from Confidential, 8/18/54)

High-speed wind tunnel tests have been made to investigate the aerodynamic characteristics at subsonic speeds of two symmetrical double-wedge airfoil sections of 4- and 6-percent thickness. Section coefficients of lift, drag, and quarter-chord pitching moment are presented for a moderate range of angles of attack at Mach numbers up to approximately 0.93. Comparisons are made between the significant characteristics of the double-wedge airfoils and those of the NACA 65-206 airfoils as an index of the merit of the former at subsonic speeds.

NACA RM A7G15

AN EXPERIMENTAL INVESTIGATION AT SUPERSONIC SPEEDS OF ANNULAR DUCT INLETS SITUATED IN A REGION OF APPRECIABLE BOUNDARY LAYER. Wallace F. Davis, George B. Brajnikoff, David L. Goldstein and Joseph M. Spiegel. September 24, 1947. 41p. diagrs., photos. (NACA RM A7G15) (Declassified from Confidential, 8/18/54)

The recovery of total pressure after diffusion to a low subsonic velocity was found to be approximately two-thirds of that through a normal shock wave occurring at the same free-stream Mach number. The cause of this low-pressure recovery is the interaction between the boundary layer and the back pressure in the diffuser. Compression at a local Mach number comparable to that of the supersonic stream will result in large losses in total pressure if the compression occurs in the presence of an appreciable boundary layer.

NACA RM A8A13

PRESSURE RECOVERY AT SUPERSONIC SPEEDS THROUGH ANNULAR DUCT INLETS SITUATED IN A REGION OF APPRECIABLE BOUNDARY LAYER. I - ADDITION OF ENERGY TO THE BOUNDARY LAYER. Wallace F. Davis and George B. Brajnikoff. April 1, 1948. 22p. diagrs., photos. (NACA RM A8A13) (Declassified from Confidential, 8/18/54)

This report contains the results of an experimental investigation made at Mach numbers between 1.36 and 2.01 of the total-pressure recovery attainable with a model having a nozzle upstream of an annular duct inlet for the purpose of ejecting high-velocity air into the boundary layer of the flow along the forebody. A comparison of the total-pressure recovery effective in producing thrust is made between a hypothetical engine that recirculates air to the intake and one that does not. It was found that for the assumed conditions recirculation would increase the effective recovery about 8 percent.

NACA RM A8B16

AN EXPERIMENTAL INVESTIGATION OF NACA SUBMERGED INLETS AT HIGH SUBSONIC SPEEDS. I - INLETS FORWARD OF THE WING LEADING EDGE. Charles F. Hall and F. Dorn Barclay. June 9, 1948. 64p. diagrs., photos. (NACA RM A8B16) (Declassified from Confidential, 8/24/54)

Results are given of an experimental investigation of NACA submerged inlets with deflectors on a fighter airplane model at Mach numbers from 0.30 to 0.875. Data are presented showing the characteristics of the model without inlets and with inlets 16.7-percent wing-root chord forward of the wing leading edge. The results indicate that the ram recovery at the entrance was affected greatly by variations in mass-flow coefficient and only slightly by Mach number and angle-of-attack variations.

NACA RM A8C22

INVESTIGATION AT SUPERSONIC SPEED (M = 1.53) OF THE PRESSURE DISTRIBUTION OVER A 63° SWEPT AIRFOIL OF BICONVEX SECTION AT ZERO LIFT. Charles W. Frick and John W. Boyd. June 10, 1948. 33p. diagrs., photos. (NACA RM A8C22) (Declassified from Confidential, 8/18/54)

The results of an investigation at supersonic speed (M = 1.53) of the distribution of pressure at zero lift over the surface of a 63° swept airfoil of biconvex section (7 percent thick) are presented. The measured pressures are compared with theoretical values calculated from thin airfoil theory.

NACA RM A8F08

PRESSURE RECOVERY AT SUPERSONIC SPEEDS THROUGH ANNULAR DUCT INLETS SITUATED IN A REGION OF APPRECIABLE BOUNDARY LAYER. II - EFFECT OF AN OBLIQUE SHOCK WAVE IMMEDIATELY AHEAD OF THE INLET. George B. Brajnikoff. August 9, 1948. 15p. diagrs., photos. (NACA RM A8F08) (Declassified from Confidential, 8/18/54)

This report contains the results of an experimental investigation made at Mach numbers between 1.36 and 2.01 of the total-pressure recovery attainable with a model having a ramp ahead of an annular inlet for the purpose of reducing the entrance Mach number by means of an oblique shock wave. It was found that the recovery improved considerably with increasing ramp angle and that a model with a 15° ramp produced approximately four-fifths of the recovery through a normal shock wave occurring at the free-stream Mach number. Use of ramp angles greater than 15° resulted in unsteady flow through the induction system and a reduction in recovery.

NACA RM A8F21

AN EXPERIMENTAL INVESTIGATION AT LARGE SCALE OF SEVERAL CONFIGURATIONS OF AN NACA SUBMERGED AIR INTAKE. Norman J. Martin and Curt A. Holzhauser. October 19, 1948. 68p. diagrs., photos., 7 tabs. (NACA RM A8F21) (Declassified from Confidential, 8/18/54)

Results of an experimental investigation in the Ames 40- by 80-foot wind tunnel of NACA submerged inlets installed on a full-scale model of a fighter airplane are presented. Tests at various inlet-velocity ratios and angles of attack indicated the same favorable characteristics that had been noted at small scale. A small difference in the magnitude of pressure recovery measured at full scale and small scale was mainly accounted for by differences of boundary-layer thickness. The effect on pressure recovery of systematic changes of ramp divergence is also presented.

NACA RM A8F22

INVESTIGATION AT SUPERSONIC SPEED (M = 1.53) OF THE PRESSURE DISTRIBUTION OVER A 63° SWEPT AIRFOIL OF BICONVEX SECTION AT SEVERAL ANGLES OF ATTACK. John W. Boyd, Elliott D. Katzen and Charles W. Frick. September 24, 1948. 41p. diagrs., photos., tab. (NACA RM A8F22) (Declassified from Confidential, 8/18/54)

The results of an investigation at supersonic speed (M = 1.53) of the distribution of pressure at angles of attack over the surface of a 63° swept airfoil of biconvex section (7 percent thick) are presented. The measured pressures are compared with theoretical values calculated from supersonic lifting-surface theory.

NACA RM A8I16

AERODYNAMIC CHARACTERISTICS AT SUBSONIC AND SUPERSONIC MACH NUMBERS OF A THIN TRIANGULAR WING OF ASPECT RATIO 2. I - MAXIMUM THICKNESS AT 20 PERCENT OF THE CHORD. Robert E. Berggren and James L. Summers. November 19, 1948. 41p. diagrs., photos. (NACA RM A8I16) (Declassified from Confidential, 8/18/54)

This report presents the results of wind-tunnel tests to determine the variation with Mach number, from 0.50 to 1.49, of the lift, drag, and pitching-moment characteristics of a 5-percent-thick symmetrical double-wedge section triangular wing. The results are compared with results of tests of similar wings from other sources and with the characteristics calculated by current analytical methods.

NACA RM A8I20

AERODYNAMIC CHARACTERISTICS AT SUBSONIC AND SUPERSONIC MACH NUMBERS OF A THIN TRIANGULAR WING OF ASPECT RATIO 2. II - MAXIMUM THICKNESS AT MIDCHORD. Harold J. Walker and Robert E. Berggren. December 3, 1948. 41p. diagrs., photos. (NACA RM A8I20) (Declassified from Confidential, 8/18/54)

This report presents the results of wind-tunnel tests to determine the variation with Mach number between limits of 0.50 and 1.49 of the lift, drag, and pitching-moment characteristics of a 5-percent-thick triangular wing. The results are compared with the characteristics calculated by analytical methods. The effects upon the characteristics due to change in location of maximum profile thickness are also discussed.

NACA RM A8I29

RAM-RECOVERY CHARACTERISTICS OF NACA SUBMERGED INLETS AT HIGH SUBSONIC SPEEDS. Charles F. Hall and Joseph L. Frank. November 17, 1948. 44p. diagrs., photos. (NACA RM A8I29) (Declassified from Confidential, 8/18/54)

Results are presented of an experimental investigation of the characteristics of NACA submerged inlets on a model of a fighter airplane for Mach numbers from 0.30 to 0.875. The effects on the ram-recovery ratio at the inlets of Mach number, angle of attack, boundary-layer thickness on the fuselage, inlet location, and boundary-layer deflectors are shown. The data indicate only a slight decrease in ram-recovery ratio for the inlets ahead of or just behind the wing leading edge as Mach number increased, but showed large decreases at high Mach numbers for the inlets aft of the point of maximum thickness of the wing.

NACA RM A8L16

INVESTIGATION OF DOWNWASH AND WAKE CHARACTERISTICS AT A MACH NUMBER OF 1.53. I - RECTANGULAR WING. Edward W. Perkins and Thomas N. Canning. March 1, 1949. 29p. diagrs. (NACA RM A8L16) (Declassified from Confidential, 8/18/54)

The results of an experimental investigation of the downwash and wake characteristics behind a rectangular plan-form wing of aspect ratio 3.5 are presented. The airfoil section was a 5-percent-thick, symmetrical double wedge. The tests were made at a Mach number of 1.53 and a Reynolds number of 1.25 million. A comparison between experimental and theoretical values of the downwash angles is made.

NACA RM A9D20

INVESTIGATION OF DOWNWASH AND WAKE CHARACTERISTICS AT A MACH NUMBER OF 1.53. II - TRIANGULAR WING. Edward W. Perkins and Thomas N. Canning. June 6, 1949. 31p. diagrs. (NACA RM A9D20) (Declassified from Confidential, 8/18/54)

The results of an experimental investigation of the downwash and wake characteristics for a triangular plan-form wing of aspect ratio 2.04 are presented. The wing had a 5-percent-thick, symmetrical, double-wedge airfoil section. The tests were made at a Mach number of 1.53 and a Reynolds number of 2 million. A comparison between experimental and theoretical values of $(d\epsilon/d\alpha)_{\alpha=0}$ showed that the agreement was good within that part of the flow field where the theory predicts downwash for positive angles of attack of the wing. Within the remainder of the flow field the agreement was only fair. At finite angles of attack the measured downwash angles depart markedly from the values predicted by the theory.

NACA RM A9F16

A COMPARISON OF TWO SUBMERGED INLETS AT SUBSONIC AND TRANSONIC SPEEDS. Emmet A. Mossman. September 15, 1949. 31p. diagrs., photos. (NACA RM A9F16) (Declassified from Confidential, 8/18/54)

A qualitative experimental study of the effects of ramp-wall divergence on ram-pressure recovery has been made at Mach numbers up to 0.96. It is shown that the use of ramp-wall divergence considerably extends the Mach number range for satisfactory submerged-inlet operation. The increase in Mach number for satisfactory pressure recovery is attributed to a less severe interaction between the shock waves and the ramp boundary layer.

NACA RM A9F20

AN EXPERIMENTAL INVESTIGATION AT LARGE SCALE OF SINGLE AND TWIN NACA SUBMERGED SIDE INTAKES AT SEVERAL ANGLES OF SIDESLIP. Norman J. Martin and Curt A. Holzhauser. August 1, 1949. 31p. diagrs., photo. (NACA RM A9F20) (Declassified from Confidential, 8/18/54)

Results of an experimental investigation in the Ames 40- by 80-foot wind tunnel of single and twin NACA submerged-intake installations on a full-scale model of a fighter airplane at several angles of sideslip are presented. The effect of sideslip on the pressure-recovery and flow characteristics is shown. The effect of sideslip on pressure recovery and duct air-flow instability was small.

NACA RM A9G15

THE EFFECT OF THE PROPELLER SLIPSTREAM ON THE CHARACTERISTICS OF SUBMERGED INLETS. Noel K. Delany. September 9, 1949. 41p. diagrs., photos. (NACA RM A9G15) (Declassified from Confidential, 8/18/54)

Wind-tunnel tests were made of submerged air inlets in the fuselage behind the propeller and forward of the wing of a 1/4-scale model of a hypothetical fighter airplane powered by a turbine-propeller unit. The results are presented for ramps with parallel and with divergent walls, and show the effect of propeller operation on the ram-recovery ratio at the entrance of the duct and at the simulated entrance of the compressor. The propeller used in these tests had dual rotation and had eight blades with thin shanks.

NACA RM A9H11

REDUCTION OF PROFILE DRAG AT SUPERSONIC VELOCITIES BY THE USE OF AIRFOIL SECTIONS HAVING A BLUNT TRAILING EDGE. Dean R. Chapman. November 1, 1949. 31p. diagrs., photo. (NACA RM A9H11) (Declassified from Confidential, 8/18/54)

A preliminary theoretical and experimental investigation has been made on the aerodynamic characteristics of blunt-trailing-edge airfoils at supersonic velocities. The theoretical considerations indicate that properly designed airfoils with moderately blunt trailing edges can have less profile drag, greater lift-curve slope, and a higher maximum lift-drag ratio than conventional sections. These predictions have been substantiated by experimental measurements on airfoils of 10-percent-thickness ratio at Mach numbers of 1.5 and 2.0, and at Reynolds numbers between 0.2 and 1.2 million.

NACA RM A9L01

WIND-TUNNEL INVESTIGATION AT MACH NUMBERS FROM 0.50 TO 1.20 OF AN ALL-MOVABLE TRIANGULAR WING OF ASPECT RATIO 4 ALONE AND WITH A BODY. Louis S. Stivers, Jr. and Alexander W. Malick. February 2, 1950. 45p. diagrs., photos., tab. (NACA RM A9L01) (Declassified from Confidential, 8/23/54)

Aerodynamic characteristics from wind-tunnel tests of semispan models are presented for an all-movable triangular wing alone and with a body (body attitude 0°). The wing had an aspect ratio of 4 and had doubly symmetrical double-wedge sections with maximum thickness-chord ratios of 0.08 in the streamwise direction. The tests were made at Mach numbers from 0.50 to about 0.98 and from 1.09 to 1.29. The corresponding Reynolds numbers varied from about 0.8×10^6 to 1.1×10^6. The experimental results are compared with calculated characteristics based on linear theory.

NACA RM A9L29

TESTS OF A SMALL-SCALE NACA SUBMERGED INLET AT TRANSONIC MACH NUMBERS. L. Stewart Rolls and George A. Rathert, Jr. February 23, 1950. 18p. diagrs., photos. (NACA RM A9L29) (Declassified from Confidential, 8/23/54)

The pressure-recovery characteristics of an NACA submerged inlet have been measured qualitatively in the Mach number range 0.60 to 1.08 by the wing-flow method. High ram-recovery ratios were maintained up to test-station Mach numbers of 1.03 to 1.08 where, for mass-flow ratios below 0.5, an abrupt loss in pressure recovery was measured.

NACA RM A50A04

STALL CHARACTERISTICS OBTAINED FROM FLIGHT 10 OF NORTHROP X-4 NO. 2 AIRPLANE (USAF NO. 46-677). Melvin Sadoff and Thomas R. Sisk. February 27, 1950. 25p. diagrs., photos., tab. (NACA RM A50A04) (Declassified from Confidential, 8/23/54)

Some limited results of stall characteristics have been obtained on a Northrop X-4 airplane. The results indicated that the motions of the airplane following the stall were mild and recovery was effected rapidly and completely with the use of down-elevon deflections. It was shown that the relative mildness of the stalls was probably due to the flat-top type of lift-curve characteristic of the 0010-64 airfoil section used, the plan form, and to the effect of sideslip on the stalling characteristics. It was further indicated that the low values of maximum normal-force coefficients obtained in gradual stall maneuvers could have been increased if corrective control had been used.

NACA RM A50C13

PRELIMINARY INVESTIGATION OF THE TRANSONIC CHARACTERISTICS OF AN NACA SUBMERGED INLET. John A. Axelson and Robert A. Taylor. June 5, 1950. 44p. diagrs., photos. (NACA RM A50C13) (Declassified from Confidential, 8/23/54)

Ram-recovery and pressure-distribution results for an NACA submerged inlet investigated on a transonic bump in the Ames 16-foot high-speed wind tunnel are presented for Mach numbers from 0.70 to 1.15, for simulated angles of attack of 0°, 4°, and 8°, and for mass-flow ratios between 0.25 and 0.68. The results indicate favorable ram-recovery characteristics for the inlet over the entire test range of Mach numbers, with the minimum ram recovery occurring around 1.05 Mach number.

NACA RM A50D27

LONGITUDINAL-STABILITY CHARACTERISTICS OF THE NORTHROP X-4 AIRPLANE (USAF NO. 46-677). Melvin Sadoff and Thomas R. Sisk. June 29, 1950. 24p. diagrs., photos., tab. (NACA RM A50D27) (Declassified from Confidential, 8/23/54)

The results obtained from several recent flights on the Northrop X-4 No. 2 airplane are presented. Information is included on the longitudinal-stability characteristics in straight flight over a Mach number range of 0.38 to about 0.63, the stability characteristics in accelerated flight over a Mach number range of 0.43 to 0.79, and the short-period longitudinal-oscillation characteristics at Mach numbers of 0.49 and 0.78. A description and a limited analysis of a pitch-up which was encountered during the accelerated stability tests at a Mach number of 0.79 and a normal-force coefficient of about 0.45 are also included.

NACA RM A50E26

INVESTIGATION AT HIGH SUBSONIC SPEEDS OF METHODS OF ALLEVIATING THE ADVERSE INTERFERENCE AT THE ROOT OF A SWEPT-BACK WING. Lee E. Boddy. August 10, 1950. 31p. diagrs., photos. (NACA RM A50E26) (Declassified from Confidential, 8/23/54)

Tests were made of a model having the 50-percent-chord line of the wing unswept or swept back 35°. The tests with the swept-back wing included modifications to the body contour and to the wing section in the region of the wing-body juncture. The divergence Mach number of the swept-back wing agreed fairly well with that predicted from tests of the unswept wing using the simple cosine concepts. Either of the modifications increased the drag-divergence Mach number of the swept-back wing about 0.01.

NACA RM A50I01

SUMMARY REPORT OF RESULTS OBTAINED DURING DEMONSTRATION TESTS OF THE NORTHROP X-4 AIRPLANES. Melvin Sadoff and Thomas R. Sisk. December 13, 1950. 46p. diagrs., photos., tab. (NACA RM A50I01) (Declassified from Confidential, 8/23/54)

The results obtained during the demonstration flight tests of the Northrop X-4 No. 1 and No. 2 airplanes are presented. Information is included on the static and the dynamic longitudinal- and lateral-stability characteristics, the stalling characteristics, and the buffet boundary.

NACA RM A50I14a

INVESTIGATION OF THE DOWNWASH AND WAKE BEHIND A TRIANGULAR WING OF ASPECT RATIO 4 AT SUBSONIC AND SUPERSONIC MACH NUMBERS. Harold J. Walker and Louis S. Stivers, Jr. December 12, 1950. 32p. diagrs. (NACA RM A50I14a) (Declassified from Confidential, 8/23/54)

Downwash and wake characteristics for a thin, symmetrical, triangular wing are presented for angles of attack up to 10° and for Mach numbers from 0.50 to 1.29, corresponding to Reynolds numbers between 0.8×10^6 and 1.1×10^6. Downwash angles are shown for locations between the 25- and the 75-percent-semispan stations at a distance of about 0.8 root-chord length downstream from the trailing edge of the wing. The location and thickness of the wake are given for the 50-percent-semispan station at a distance of 3.44 root-chord lengths downstream from the trailing edge. A number of comparisons between the results from experiment and theory are also included.

NACA RM A50J09

LIFT AND MOMENT CHARACTERISTICS AT SUBSONIC MACH NUMBERS OF FOUR 10-PERCENT-THICK AIRFOIL SECTIONS OF VARYING TRAILING-EDGE THICKNESS. James L. Summers and William A. Page. December 20, 1950. 32p. diagrs., photos. (NACA RM A50J09) (Declassified from Confidential, 8/31/54)

The results of a wind-tunnel investigation from 0.3 to 0.9 Mach number of the lift and moment characteristics of four 10-percent-thick circular-arc airfoil sections having trailing-edge thicknesses of 0, 25, 50, and 100 percent of the maximum thickness are presented. It was observed that increases in the trailing-edge thickness resulted in increases in maximum lift coefficient and lift-curve slope at all Mach numbers and in increases in lift-divergence Mach number at all lift coefficients. Kármán vortex streets were produced by the thick trailing-edge sections indicating the presence of fluctuating lifts and high drags. It was further noted that a splitter plate at the trailing edge and in the chord plane eliminated the vortex streets.

NACA RM A50J09b

WIND-TUNNEL INVESTIGATION AT MACH NUMBERS FROM 0.50 TO 1.29 OF AN UNSWEPT TAPERED WING OF ASPECT RATIO 2.67 WITH LEADING- AND TRAILING-EDGE FLAPS - TRAILING-EDGE FLAPS DEFLECTED. Louis S. Stivers, Jr. and Alexander W. Malick. December 13, 1950. 45p. diagrs., photo., 5 tabs. (NACA RM A50J09b) (Declassified from Confidential, 8/31/54)

Aerodynamic characteristics are presented for an unswept wing having an aspect ratio of 2.67, a taper ratio of 0.5, and full-span, 25-percent-chord, plain, trailing-edge flaps. Sections of the wing were 8-percent chord thick from the 25- to the 75-percent-chord points tapering to sharp leading and trailing edges. The data were determined from wind-tunnel tests of the semispan model for a range of angles of attack from -3° to 12° and for a range of flap deflections from -10° to 60° at Mach numbers from 0.50 to about 0.98 and from 1.09 to 1.29. The corresponding Reynolds numbers varied from about 0.94×10^6 to 1.27×10^6.

NACA RM A50K10

WIND-TUNNEL INVESTIGATION AT MACH NUMBERS FROM 0.50 TO 1.29 OF AN UNSWEPT, TAPERED WING OF ASPECT RATIO 2.67 WITH LEADING- AND TRAILING-EDGE FLAPS - LEADING-EDGE FLAPS DEFLECTED. Louis S. Stivers, Jr. and Alexander W. Malick. February 26, 1951. 37p. diagrs., photo., 5 tabs. (NACA RM A50K10) (Declassified from Confidential, 8/31/54)

Results of a wind-tunnel investigation are presented for a semispan model of an unswept wing having an aspect ratio of 2.67, a taper ratio of 0.5, and full-span, 25-percent-chord, plain, leading-edge flaps. Sections of the wing in the streamwise direction were uniform 8-percent chord thick from the 25- to the 75-percent-chord points tapering to sharp leading and trailing edges. The data were obtained for a range of angles of attack from -3° to 12° and for a range of flap deflections from -20° to 10° at Mach numbers from about 0.50 to 0.95 and from 1.09 to 1.29. The corresponding Reynolds numbers varied from about 0.94×10^6 to about 1.27×10^6.

NACA RM A50K15

THE EFFECTS OF CENTRALLY MOUNTED WING-TIP TANKS ON THE SUBSONIC AERODYNAMIC CHARACTERISTICS OF A WING OF ASPECT RATIO 10 WITH 35° OF SWEEPBACK. Bruce E. Tinling and W. Richard Kolk. February 21, 1951. 44p. diagrs., photos., 2 tabs. (NACA RM A50K15) (Declassified from Confidential, 8/31/54)

This report presents results of a wind-tunnel investigation of the effects of centrally mounted wing-tip tanks on the aerodynamic characteristics of a wing having an aspect ratio of 10 with 35° of sweepback of the quarter-chord line. Three tip tanks of equal volume having fineness ratios of 10, 6.67, and 5 were tested. The effects of a vane near the tank-wing juncture were also investigated. Lift, drag, and pitching-moment data are presented. The Reynolds number of the tests was varied from 2,000,000 to 10,000,000 at a Mach number of 0.25, and the Mach number was varied from 0.25 to 0.90 at a Reynolds number of 2,000,000.

NACA RM A50K27

THE EFFECTS OF MACH NUMBER AND REYNOLDS NUMBER ON THE AERODYNAMIC CHARACTERISTICS OF SEVERAL 12-PERCENT-THICK WINGS HAVING 35° OF SWEEPBACK AND VARIOUS AMOUNTS OF CAMBER. Bruce E. Tinling and W. Richard Kolk. February 23, 1951. 68p. diagrs., photo., tab. (NACA RM A50K27) (Declassified from Confidential, 8/31/54)

Six semispan model wings with 35° of sweepback were tested: three of aspect ratio 10, and three of aspect ratio 5. The thickness distribution of the wing sections was the same from root to tip and there was no twist. The streamwise sections of the three wings of each aspect ratio were the NACA 65_1A012, the NACA 64_1A312, and the NACA 64_1A612. Lift, drag, and pitching-moment data are presented. The Reynolds number of the tests was varied from 2,000,000 to 10,000,000 at a Mach number of 0.25, and the Mach number was varied from 0.25 to 0.92 at a Reynolds number of 2,000,000.

NACA RM A50K27b

WIND-TUNNEL INVESTIGATION AT MACH NUMBERS FROM 0.50 TO 1.29 OF AN UNSWEPT, TAPERED WING OF ASPECT RATIO 2.67 WITH LEADING- AND TRAILING-EDGE FLAPS - FLAPS DEFLECTED IN COMBINATION. Louis S. Stivers, Jr. and Alexander W. Malick. February 26, 1951. 41p. diagrs., photo., 7 tabs. (NACA RM A50K27b) (Declassified from Confidential, 8/31/54)

Aerodynamic characteristics from wind-tunnel tests of a semispan model are presented for an unswept wing having an aspect ratio of 2.67, a taper ratio of 0.5, and full-span, 0.25 chord, plain, leading- and trailing-edge flaps. Sections of the wing were uniform 0.08 chord thick from the 0.25 to the 0.75 chord points and tapered to sharp leading and trailing edges. The data are presented for a range of angles of attack from -3° to 12° and for ranges of leading-edge-flap deflection from -20° to 10° and of trailing-edge-flap deflection from 0° to 60°. The Mach numbers ranged from about 0.50 to 0.98 and from 1.09 to 1.29 with corresponding Reynolds numbers varying from about 0.94×10^6 to 1.27×10^6.

NACA RM A50L12

PRELIMINARY INVESTIGATION OF THE DELAY OF TURBULENT FLOW SEPARATION BY MEANS OF WEDGE-SHAPED BODIES. George B. McCullough, Gerald E. Nitzberg and John A. Kelly. March 1, 1951. 28p. diagrs., photos. (NACA RM A50L12) (Declassified from Confidential, 8/31/54)

A wind-tunnel investigation of pyramidal, wedge-like bodies as devices for delaying separation of a turbulent boundary layer was conducted. The flow fields of individual wedges mounted on a flat plate and of multiple wedges applied to a two-dimensional airfoil were studied. Substantial increases of maximum lift and reductions of drag at high lift coefficients were realized at the expense of doubling the zero-lift drag. A brief investigation of vane-type vortex generators gave comparable increases of maximum lift with about one-half the incremental drag of the wedges at zero lift.

NACA RM A51A12

THE TRANSONIC CHARACTERISTICS OF 17 RECTANGULAR, SYMMETRICAL WING MODELS OF VARYING ASPECT RATIO AND THICKNESS. Warren H. Nelson and John B. McDevitt. May 10, 1951. 91p. diagrs., photos. (NACA RM A51A12) (Declassified from Confidential, 8/31/54)

An investigation utilizing the transonic-bump technique was made to determine the aerodynamic characteristics of transonic Mach numbers of 17 rectangular wings having aspect ratios of 6, 4, 2, and 1, and NACA 63A0XX sections with thickness-to-chord ratios of 10, 8, 6, 4, and 2 percent. The Mach number range was 0.4 to 1.1, corresponding under the test conditions to a Reynolds number range from 1.25 to 2.05 million. These data are presented without analysis.

NACA RM A51B16

EXPERIMENTAL DOWNWASH AND WAKE CHARACTERISTICS AT SUBSONIC AND SUPERSONIC MACH NUMBERS BEHIND AN UNSWEPT, TAPERED WING OF ASPECT RATIO 2.67 WITH LEADING- AND TRAILING-EDGE FLAPS. Harold J. Walker, Louis S. Stivers, Jr. and Luther Beard, Jr. April 20, 1951. 43p. diagrs. (NACA RM A51B16) (Declassified from Confidential, 8/31/54)

Results of a wind-tunnel investigation are presented which show the effects of flap deflection and Mach number on the downwash and wake characteristics at distances of 1.80 and 4.74 mean aerodynamic chord lengths, respectively, downstream from the midchord line of a semispan model of an unswept, tapered wing of aspect ratio 2.67 with full-span, 25-percent-chord, plain, leading- and trailing-edge flaps. Sections of the wing were 8-percent chord thick from the 25- to the 75-percent-chord points, and tapered to sharp leading and trailing edges. The data were obtained for flap deflections ranging from -20° to 40° at Mach numbers from 0.50 to 1.29. The corresponding Reynolds numbers varied from 0.94×10^6 to 1.27×10^6.

NACA RM A51C14

A SEMIEMPIRICAL METHOD FOR CALCULATING THE PITCHING MOMENT OF BODIES OF REVOLUTION AT LOW MACH NUMBERS. Edward J. Hopkins. May 17, 1951. 27p. diagrs., tab. (NACA RM A51C14) (Declassified from Confidential, 8/31/54)

A semiempirical method, in which potential theory is arbitrarily combined with an approximate viscous theory, for calculating the aerodynamic pitching moments for bodies of revolution is presented. The method can also be used for calculating the lift and drag forces. The calculated and experimental force and moment characteristics of 15 bodies of revolution are compared.

NACA RM E7F13

INVESTIGATION OF SHOCK DIFFUSERS AT MACH NUMBER 1.85. III - MULTIPLE-SHOCK AND CURVED-CONTOUR PROJECTING CONES. W. E. Moeckel and J. F. Connors. August 13, 1947. 23p. diagrs., photos. (NACA RM E7F13) (Declassified from Confidential, 8/18/54)

The configurations tested were; a cone designed to produce three oblique shocks ahead of the diffuser inlet in combination with a straight and curved inlet section; a cone generated by a parabolic arc, also in combination with a curved and a straight inlet section; a cone-inlet combination designed by the method of characteristics to produce an isentropic entrance flow at an angle of attack of 0°; and a 30° single-shock cone in combination with a perforated inlet section. The effect of angle of attack was also investigated for the isentropic configuration.

NACA RM E7K21

COMPARISON OF HOVERING PERFORMANCE OF HELICOPTERS POWERED BY JET-PROPULSION AND RECIPROCATING ENGINES. Virginia L. Brightwell, Max D. Peters and J. C. Sanders. June 11, 1948. 39p. diagrs., 3 tabs. (NACA RM E7K21) (Declassified from Confidential, 8/18/54)

An analysis was made to compare the fuel consumptions of three jet engines and one reciprocating engine used to power helicopters in hovering flight at sea level. The calculations showed that the conventional reciprocating engine permitted much longer hovering time than the jet-propulsion engines investigated, but because the jet-propulsion engines were lighter than the reciprocating engine, the jet-propelled helicopters could lift greater disposable loads.

NACA RM E8C16

STUDY OF STRESS STATES IN GAS-TURBINE DISK AS DETERMINED FROM MEASURED OPERATING-TEMPERATURE DISTRIBUTIONS. J. Elmo Farmer, M. B. Millenson and S. S. Manson. July 21, 1948. 41p. diagrs., photos. (NACA RM E8C16) (Declassified from Confidential, 8/18/54)

Results are presented of an experimental investigation to determine the temperature distribution in an aircraft-engine gas-turbine disk. High axial- and radial-temperature gradients were found to exist both when the engine was accelerated as rapidly as possible to maximum speed and power output and when it was gradually brought to these conditions in a manner typical of normal service operation. Calculated stresses based on the measured temperature distributions are presented.

NACA RM E8K24

COMPARISON OF PERFORMANCE OF AN-F-58 AND AN-F-32 FUELS IN J33-A-23 TURBOJET ENGINE. H. D. Wilsted and J. C. Armstrong. June 2, 1949. 33p. photos., diagrs., tab. (NACA RM E8K24) (Declassified from Confidential, 8/18/54)

Performance of fuels corresponding to specifications AN-F-58 and AN-F-32 was investigated using a J33-A-23 turbojet engine. Comparatively, AN-F-58 fuel indicated equal performance in terms of engine thrust and fuel consumption, improved altitude starting, improved blow-out limits, higher but non-detrimental carbon-deposition rate, and iron oxide contamination. If contaminating iron oxide can be excluded from the engine, AN-F-58 fuel is considered satisfactory.

NACA RM E8K26

EXPERIMENTAL PRESSURE DISTRIBUTIONS OVER WING TIPS AT MACH NUMBER 1.9. I - WING TIP WITH SUBSONIC LEADING EDGE. James M. Jagger and Harold Mirels. January 27, 1949. 28p. diagrs., photo. (NACA RM E8K26) (Declassified from Confidential, 8/18/54)

An investigation was conducted at Mach number of 1.91 to determine spanwise pressure distribution over a wing tip in a region influenced by a sharp subsonic leading edge swept back at 70°. Except for pressure distribution on the top surface in the immediate vicinity of the subsonic leading edge, the maximum difference between linearized theory and experimental data was 2-1/2 percent (of free-stream dynamic pressure) for angles of attack up to 4° and 7 percent for angles of attack up to 8°. Pressures on the top surface nearest the subsonic edge indicated local expansions beyond values predicted by linearized theory.

NACA RM E8L24
National Advisory Committee for Aeronautics.
ALTITUDE PERFORMANCE OF AN-F-58 FUELS IN J33-A-21 SINGLE COMBUSTOR. Ralph T. Dittrich and Joseph L. Jackson. April 8, 1949. 23p. diagrs., 2 tabs. (NACA RM E8L24) (Declassified from Confidential, 8/18/54)

Three fuels conforming to AN-F-58 specification were investigated in order to determine the influence of boiling temperatures and aromatic content on altitude performance in single combustor of a 4600-pound-thrust turbojet engine. Combustion efficiencies of the three AN-F-58 fuels were approximately equal at each simulated engine condition for altitudes from 5,000 to 50,000 feet, 90-percent normal rated engine speed, and flight Mach numbers of 0.0 and 0.6.

NACA RM E9D06

CARBON DEPOSITION FROM AN-F-58 FUELS IN A J33 SINGLE COMBUSTOR. Jerrold D. Wear and Howard W. Douglass. June 24, 1949. 27p. diagrs., photos., 2 tabs. (NACA RM E9D06) (Declassified from Confidential, 8/18/54)

Effects of change in boiling temperature and aromatic content of AN-F-58 fuels on carbon deposition and change in simulated engine operating conditions on carbon deposition were evaluated in a J33 single combustor. Effect of carbon deposits in the combustor on altitude operational limits was investigated. Carbon deposition increased with increase in boiling temperature at constant aromatic content and with increase in aromatic content of the AN-F-58 fuels. Operational limits occurred at slightly lower altitudes when the combustor assembly contained carbon deposits than when it did not.

NACA RM E9H15

DOWNWASH IN VORTEX REGION BEHIND TRAPEZOIDAL-WING TIP AT MACH NUMBER 1.91. J. L. Cummings, H. Mirels and L. E. Baughman. November 10, 1949. 39p. diagrs., photos. (NACA RM E9H15) (Declassified from Confidential, 8/18/54)

Results of an experimental investigation to determine downwash and wake characteristics in region of trailing vortex system behind a trapezoidal-wing tip at Mach number 1.91 are presented. The wing was cut along inner Mach line from the tip and had a 5-percent-thick symmetrical diamond cross section. For small angles of attack, the experimental spanwise variation of $-d\epsilon/d\alpha$ (where ϵ is the downwash angle and α is the angle of attack) was generally similar to the variation predicted by linearized theory. At higher angles of attack, differences between the experimental and theoretical variations were attributed to a modification of the spanwise distribution of shed vorticity and a distortion of the shed vortex sheet.

NACA RM E9H17

ANALYTICAL DETERMINATION OF EFFECT OF WATER INJECTION ON POWER OUTPUT OF TURBINE-PROPELLER ENGINE. Albert O. Ross and Merle C. Huppert. November 3, 1949. 29p. diagrs. (NACA RM E9H17) (Declassified from Confidential, 8/18/54)

An analysis is presented to show the effect of evaporative cooling of the charge air during compression on the performance of a turbine-propeller engine incorporating a centrifugal compressor. Calculations were made with water as the cooling agent for compressor tip speeds of 1200, 1500, and 1800 feet per second. Results indicated that a power augmentation of 200 percent is possible at a compressor tip speed of 1800 feet per second if sufficient water is evaporated during compression to saturate the air at the compressor outlet.

NACA RM E9I22a

EXPERIMENTAL PRESSURE DISTRIBUTIONS OVER WING TIPS AT MACH NUMBER 1.9. II - WING TIP WITH SUBSONIC TRAILING EDGE. Harold Mirels and James M. Jagger. December 21, 1949. 23p. diagrs., photo. (NACA RM E9I22a) (Declassified from Confidential, 8/18/54)

An investigation was conducted at Mach number 1.90 to determine experimental pressure distribution over a wing tip in region influenced by sharp subsonic trailing edge. Experimental pressure distribution in region influenced by subsonic trailing edge was generally in poor agreement with linearized theory. Difference between theory and experiment was attributed to separation associated with adverse pressure gradient predicted by linearized theory for this region.

NACA RM E50D05

EXPERIMENTAL INVESTIGATION OF SUPERSONIC FLOW WITH DETACHED SHOCK WAVES FOR MACH NUMBERS BETWEEN 1.8 AND 2.9. W. E. Moeckel. July 5, 1950. 56p. diagrs., photos., 4 tabs. (NACA RM E50D05) (Declassified from Confidential, 8/23/54)

An experimental investigation of the flow near the nose of plane and axially symmetric bodies was conducted to check the predictions of theory. The location of the detached wave was determined for a variety of nose forms over a range of Mach numbers from 1.8 to 2.9. At a Mach number of 1.9, the form of the detached wave and the pressure distribution near the nose were also investigated. In addition, the relation between shock location and flow spillage was determined for several nose inlets. Most of the experimental results agreed to good approximation with the results predicted by the one-dimensional continuity method.

NACA RM E50D19

EFFECT OF INLET TEMPERATURE AND HUMIDITY ON THRUST AUGMENTATION OF TURBOJET ENGINE BY COMPRESSOR-INLET INJECTION. Thomas B. Shillito and James L. Harp, Jr. July 3, 1950. 46p. diagrs., photos. (NACA RM E50D19) (Declassified from Confidential, 8/23/54)

An investigation was conducted to determine the effect of inlet temperature and humidity on turbojet-engine performance with water-alcohol injection at the compressor inlet. At a constant total liquid flow (fuel flow plus injected flow) the augmented thrust ratio increased with compressor-inlet temperature. At a given inlet temperature and injection rate, the thrust decreased slightly with increasing humidity.

NACA RM E50E03a

EXPERIMENTAL INVESTIGATION OF SPREADING CHARACTERISTICS OF CHOKED JETS EXPANDING INTO QUIESCENT AIR. Morris D. Rousso and Fred D. Kochendorfer. August 9, 1950. 39p. diagrs., photos., tab. (NACA RM E50E03a. Now RM E51F18) (Declassified from Confidential, 8/23/54)

The boundaries of single and twin jets discharging into quiescent air are presented for several values of nozzle-outlet pressure ratio and spacing between nozzles. The effects of jet temperature, Reynolds number, and humidity on jet spreading are briefly evaluated. The results indicate that for a jet temperature ratio of 2.6 the pressure boundaries are slightly smaller than those of corresponding unheated jets and that the effects of Reynolds number and humidity are negligible.

NACA RM E50F12

INVESTIGATION OF PERFORATED CONVERGENT-DIVERGENT DIFFUSERS WITH INITIAL BOUNDARY LAYER. Maynard I. Weinstein. August 15, 1950. 26p. diagrs., photo. (NACA RM E50F12) (Declassified from Confidential, 8/23/54)

An experimental investigation was made at Mach number 1.90 of the performance of a series of perforated convergent-divergent supersonic diffusers operating with initial boundary layer, which was induced and controlled by lengths of cylindrical inlets affixed to the diffusers. Supercritical mass-flow and peak total-pressure recoveries were decreased slightly by use of the longest inlets (4 inlet diameters in length). Combinations of cylindrical inlets, perforated diffusers, and a subsonic diffuser were evaluated as simulated wind tunnels having second throats. Comparisons with noncontracted configurations of similar scale indicated conservatively computed power reductions of 25 percent.

NACA RM E50H10

DOWNWASH IN VORTEX REGION BEHIND RECTANGULAR HALF-WING AT MACH NUMBER 1.91. John L. Cummings and Rudolph C. Haefeli. October 26, 1950. 43p. diagrs., photos., tab. (NACA RM E50H10) (Declassified from Confidential, 8/23/54)

Results of an experimental investigation to determine downwash and wake characteristics in region of trailing vortex system behind a rectangular half-wing at Mach number 1.91 are presented. The wing had a 5-percent thick symmetric diamond cross section beveled to a knife edge at the tip. At small angles of attack, downwash angles were in close agreement with predictions of linearized theory based on the assumption of an undistorted vortex sheet. At higher angles of attack, the flow was greatly influenced by the rolling up of the vortex sheet.

NACA RM E50H28

COMBUSTION EFFICIENCY AND ALTITUDE OPERATIONAL LIMITS OF THREE LIQUID HYDROCARBON FUELS HAVING HIGH VOLUMETRIC ENERGY CONTENT IN A J33 SINGLE COMBUSTOR. Edward G. Stricker. November 6, 1950. 22p. diagrs., tab. (NACA RM E50H28) (Declassified from Confidential, 8/23/54)

Combustion efficiency and altitude operational limits were determined in a J33 single combustor for AN-F-58 fuel and three liquid hydrocarbon fuels having high volumetric energy content (decalin, tetralin, and monomethylnaphthalene) at simulated altitude and combustor inlet-air conditions. At the conditions investigated, the combustion efficiency for the four fuels generally decreased with an increase in volumetric energy content. The altitude operational limits for decalin and tetralin fuels were higher than for AN-F-58 fuel; monomethylnaphtalene fuel gave the lowest altitude operational limit.

NACA RM E50H29

INVESTIGATION OF POWER REQUIREMENTS FOR ICE PREVENTION AND CYCLICAL DE-ICING OF INLET GUIDE VANES WITH INTERNAL ELECTRIC HEATERS. Uwe von Glahn and Robert E. Blatz. December 1, 1950. 49p. diagrs., photos. (NACA RM E50H29) (Declassified from Confidential, 8/23/54)

An investigation was conducted to determine the electric power requirements for turbojet-engine inlet guide vanes with continuous heating and with cyclical de-icing for a range of icing conditions. Minimum total power requirements for continuous heating and dyclical de-icing are presented in terms of average surface datum temperature. An analysis is included to extend the experimentally obtained continuous heating data to vane sizes and icing conditions other than those investigated. Cyclical de-icing provides a total power saving as high as 79 percent over continuous heating for a typical engine installation. Heat-on periods of 10 seconds or less with heat-off periods of 60 seconds are recommended for cyclical de-icing.

NACA RM E50I08

ICING CHARACTERISTICS AND ANTI-ICING HEAT REQUIREMENTS FOR HOLLOW AND INTERNALLY MODIFIED GAS-HEATED INLET GUIDE VANES. Vernon H. Gray and Dean T. Bowden. December 5, 1950. 49p. diagrs., photos. (NACA RM E50I08) (Declassified from Confidential, 8/23/54)

Gas temperatures and flow rates required for anti-icing a two-dimensional cascade of turbojet inlet guide vanes were determined for hollow and internally modified vanes. The pressure losses caused by icing on unheated guide vanes were also determined. Less heat was required for anti-icing internally modified blades than for the hollow blades. Pressure losses across the cascade were greater at an inlet temperature of 22° F than at 0° F because of the characteristic shapes of ice deposits at the two temperatures.

NACA RM E50K14

SUPERSONIC TUNNEL INVESTIGATION BY MEANS OF INCLINED-PLATE TECHNIQUE TO DETERMINE PERFORMANCE OF SEVERAL NOSE INLETS OVER MACH NUMBER RANGE OF 1.72 TO 2.18. Jerome L. Fox. February 14, 1951. 27p. diagrs., photos. (NACA RM E50K14) (Declassified from Confidential, 8/31/54)

A suspended flat plate was used to continuously vary the Mach number in the NACA Lewis 18- by 18-inch Mach number 1.91 supersonic tunnel. Useful range of the tunnel was extended over range of Mach numbers from 1.72 to 2.18. Maximum variations in Mach number of the flow produced at vicinity of nose inlets at zero angle of attack were ±0.01 and flow angularities were less than approximately 0.35°. The technique was applied to determination of pressure recovery and mass-flow characteristics of four supersonic nose inlets over Mach number range produced.

NACA RM E50L08

INVESTIGATION OF THREE TYPES OF SUPERSONIC DIFFUSER OVER A RANGE OF MACH NUMBERS FROM 1.75 TO 2.74. L. Eugene Baughman and Lawrence I. Gould. March 12, 1951. 37p. diagrs., photos. (NACA RM E50L08) (Declassified from Confidential, 8/31/54)

An investigation was conducted to determine the off-design pressure recovery, mass-flow, and thrust characteristics of a normal-shock diffuser, two single-shock spike diffusers, and three convergent-divergent perforated diffusers operating in the Mach number range between 1.75 and 2.74.

NACA RM L6I11

DRAG MEASUREMENTS OF A 34° SWEPT-FORWARD AND SWEPT-BACK NACA 65-009 AIRFOIL OF ASPECT RATIO 2.7 AS DETERMINED BY FLIGHT TESTS AT SUPERSONIC SPEEDS. Sidney R. Alexander. February 20, 1947. 11p. diagrs., photos. (NACA RM L6I11) (Declassified from Confidential, 8/18/54)

The data were obtained by tracking rocket-propelled winged bodies moving at supersonic speeds. The test results show that for the comparable Mach number range investigated ($M = 0.9 - 1.30$) both the 34° swept-forward and swept-back airfoils produced lower values of zero-lift drag than the unswept airfoil. At Mach numbers between 1.0 and 1.3, the drag of the swept-back wing was about 50 percent and that of the swept-forward wing about 65 percent of the unswept wing.

NACA RM L6K21

LONGITUDINAL STABILITY AND CONTROL CHARACTERISTICS OF A SEMISPAN AIRPLANE MODEL WITH A SWEPT-BACK TAIL FROM TESTS AT TRANSONIC SPEEDS BY THE NACA WING-FLOW METHOD. John A. Zalovcik and Richard H. Sawyer. March 28, 1947. 30p. diagrs., photos., tab. (NACA RM L6K21) (Declassified from Confidential, 8/18/54)

The model was mounted in such a way as to permit it to assume a position of zero pitching moment about the center of gravity at 27 percent of the mean aerodynamic chord. Measurements were made of lift and angle of attack for trim for several stabilizer and elevator settings. Because of the chordwise variation of Mach number in the test region, the effective Mach number for the wing of the model was lower than that for the tail of the model.

NACA RM L6L09

OBSERVATIONS ON AN AILERON-FLUTTER INSTABILITY ENCOUNTERED ON A 45° SWEPT-BACK WING IN TRANSONIC AND SUPERSONIC FLIGHT. Marvin Pitkin, William N. Gardner and Howard J. Curfman, Jr. April 11, 1947. 23p. diagrs., photos. (NACA RM L6L09) (Declassified from Confidential, 8/18/54)

Flight data are presented showing the free-floating and oscillatory characteristics of the wing and aileron. It is shown that aileron vibration occurred at flight velocities corresponding to a Mach number range from 1.03 to 1.4. The frequencies of the aileron and wing oscillations were identical at a given Mach number, were of the order of 100 cycles per second, and increased with Mach number. The test data indicate that aileron compressibility flutter is delayed in appearance but not prevented by sweepback.

NACA RM L6L24

DRAG OF A WING-BODY CONFIGURATION CONSISTING OF A SWEPT-FORWARD TAPERED WING MOUNTED ON A BODY OF FINENESS RATIO 12 MEASURED DURING FREE FALL AT TRANSONIC SPEEDS. Jim Rogers Thompson and Charles W. Mathews. March 13, 1947. 15p. diagrs., photos. (NACA RM L6L24) (Declassified from Confidential, 8/18/54)

The total drag and the drag of the wing were measured separately. These measurements were made to determine optimum aerodynamic shapes and configurations for use in the transonic and supersonic velocity ranges, and show that the drag of the complete configuration rose almost linearly from 0.07 of atmospheric pressure per unit of frontal area at a Mach number of 0.90 to 0.30 of atmospheric pressure at a Mach number of 1. 02.

NACA RM L6L30

DRAG MEASUREMENTS OF A SWEPT-BACK WING HAVING INVERSE TAPER AS DETERMINED BY FLIGHT TESTS AT SUPERSONIC SPEEDS. Sidney R. Alexander. April 8, 1947. 12p. diagrs., photo. (NACA RM L6L30) (Declassified from Confidential, 8/18/54)

The test results showed that for the comparable Mach number range investigated (M = 1.0 to 1.275), the tapered wing produced values of drag coefficient that averaged about 30 percent lower than those of the 34° swept-back untapered wing and about 20 percent higher than those of the 45° swept-back untapered wing. At Mach numbers of 1.1 and 1.2, the tapered wing revealed drag coefficients of 0.0195 and 0.0225, the latter value being the maximum value obtained for this arrangement. The data were obtained by radar tracking of the rocket-propelled winged body moving at supersonic speeds.

NACA RM L7A03

FORCE AND LONGITUDINAL CONTROL CHARACTERISTICS OF A 1/16 – SCALE MODEL OF THE BELL XS-1 TRANSONIC RESEARCH AIRPLANE AT HIGH MACH NUMBERS. Axel T. Mattson. May 21, 1947. 32p. diagrs., photo., tab. (NACA RM L7A03) (Declassified from Confidential, 8/18/54)

The results given do not present completely the force and longitudinal control characteristics of the model. General trends are illustrated, however, which can be qualitatively analyzed for level-flight Mach numbers up to 0.93. A large increase in drag coefficient occurs beyond a Mach number of 0.78. At a Mach number of approximately 0.825 an initial lift force break occurs. This force break, up to a Mach number of approximately 0.875, is not severe, although elevator-control effectiveness is decreasing. At a Mach number of 0.9, use of the stabilizer as a trim control is required.

NACA RM L7E08

MEASUREMENTS OF THE EFFECTS OF THICKNESS RATIO AND ASPECT RATIO ON THE DRAG OF RECTANGULAR-PLAN-FORM AIRFOILS AT TRANSONIC SPEEDS. Jim Rogers Thompson and Charles W. Mathews. June 20, 1947. 17p. diagrs., photo. (NACA RM L7E08) (Declassified from Confidential, 8/18/54)

In the present paper results are presented for two airfoils of the series (those having NACA 65-012 sections and aspect ratios of 7.6 and 5.1) and are compared with results for other airfoils of the series which were previously reported. At sonic and low supersonic speeds the pressure-drag coefficient was found to vary in proportion to the square of the thickness ratio between values of thickness ratio of 0.09 and 0.12 but between values of thickness ratio of 0.06 and 0.09 the exponent was somewhat less than 2.

NACA RM L7E26

FLIGHT TESTS TO DETERMINE THE EFFECT OF TAPER ON THE ZERO-LIFT DRAG OF WINGS AT LOW SUPERSONIC SPEEDS. Sidney R. Alexander and Robert L. Nelson. July 13, 1947. 19p. diagrs., photos. (NACA RM L7E26) (Declassified from Confidential, 8/18/54)

At a constant leading-edge sweep of 45° no orderly variation of drag coefficient with taper ratio occurs, the variation being dependent upon the Mach number. Maximum thickness, leading-edge, and trailing-edge sweep are all important in determining the drag coefficient of a tapered wing. A comparison is made between the results of theoretical drag calculations of tapered wings and applicable experimental values derived herein.

NACA RM L7G02

A TORSIONAL STIFFNESS CRITERION FOR PREVENTING FLUTTER OF WINGS OF SUPERSONIC MISSILES. Bernard Budiansky, Joseph N. Kotanchik and Patrick T. Chiarito. August 28, 1947. 14p. diagrs., tab. (NACA RM L7G02) (Declassified from Confidential, 8/18/54)

Failures probably due to flutter were encountered in NACA flight tests of several rocket-powered, drag-research missiles that were intended to attain Mach numbers of about 1.4. The wing failures of these missiles led to the development of a simple, semi-rational torsional stiffness criterion for preventing flutter of uniform, sweptback or unswept missile wings that attain supersonic speeds. Results of missile flights at speeds up to Mach number 1.4 demonstrate the usefulness of the formula.

NACA RM L7K20

WIND-TUNNEL INVESTIGATION OF A WING-FUSELAGE COMBINATION WITH EXTERNAL STORES. H. Norman Silvers and Kenneth P. Spreemann. July 9, 1948. 55p. diagrs. (NACA RM L7K20) (Declassified from Confidential, 8/18/54)

Contains drag measurements of several external-store installations specifically designed to delay the advent of airplane buffet due to stores which has been recognized in wing-tunnel data as a sharp increase of the drag coefficient of the external-store installation. Results indicate that of the arrangements tested the highest store drag rise Mach number may be obtained by locating the store maximum thickness at large chordwise distance from the wing maximum thickness or by attaching the store flush to the wing lower surface, thus eliminating the pylon suspension system typical of current installations.

NACA RM L8A28a

FACTORS AFFECTING LATERAL STABILITY AND CONTROLLABILITY. John P. Campbell and Thomas A. Toll. May 13, 1948. 19p. diagrs. (NACA RM L8A28a) (Declassified from Confidential, 8/18/54)

The effects ondynamic lateral stability and controllability of some of the important aerodynamic and mass characteristics are discussed and methods are presented for estimating the various stability parameters to be used in the calculation of the dynamic lateral stability of airplanes with swept and low-aspect-ratio wings.

NACA RM L8H31

AN INVESTIGATION OF THE LOW-SPEED STATIC STABILITY CHARACTERISTICS OF COMPLETE MODELS HAVING SWEPTBACK AND SWEPT FORWARD WINGS. M. Leroy Spearman and Paul Comisarow. November 19, 1948. 51p. diagrs., tab. photos. (NACA RM L8H31) (Declassified from Confidential, 8/18/54)

An investigation has been conducted in the Langley 300 mph 7- by 10-foot tunnel to determine the static stability characteristics at low speeds of complete models with various swept wings so that comparisons might be made with available theoretical and emphirical methods of predicting the stability characteristics. Longitudinal and lateral stability characteristics, flaps up and down, were obtained for models having 0°, 15°, 30°, and 45° sweptforward and sweptback wings.

NACA RM L8J28

SUMMARY OF RESULTS OF TUMBLING INVESTIGATIONS MADE IN THE LANGLEY 20-FOOT FREE-SPINNING TUNNEL ON 14 DYNAMIC MODELS. Ralph W. Stone, Jr. and Robert L. Bryant. December 31, 1948. 91p. diagrs., photos., 23 tabs. (NACA RM L8J28) (Declassified from Confidential, 8/18/54)

The tumbling characteristics of dynamic models of 14 specific airplane designs tested in the Langley 20-foot free-spinning tunnel for various loadings and configurations have been summarized. Both tailless and conventional airplane configurations were considered. Sweep angles varied from 15° forward to a 60° delta wing. Aspect ratios varied from 1.27 to 10.6. Consideration has also been given to the problem of accelerations encountered during a tumble, pilot escape, and use of wing-tip parachutes for termination of the tumbling motion.

NACA RM L9A17

PRELIMINARY TANK INVESTIGATION OF THE USE OF SINGLE MONOPLANE HYDROFOILS FOR HIGH-SPEED AIRPLANES. Douglas A. King and John A. Rockett. March 22, 1949. 35p. diagrs., photos., 6 tabs. (NACA RM L9A17) (Declassified from Confidential, 8/18/54)

Presents results of hydrodynamic take-off and landing tests of a model of a hypothetical high-speed airplane fitted with a variety of single hydrofoils mounted near the center of gravity. Instability occurred during take-off when the hydrofoil of any configuration emerged. The hydrodynamic resistance was greater than that of conventional hulls.

NACA RM L9A21

AERODYNAMIC CHARACTERISTICS OF A WING WITH QUARTER-CHORD LINE SWEPT BACK 45°, ASPECT RATIO 4, TAPER RATIO 0.6, AND NACA 65A006 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. Joseph Weil and Kenneth W. Goodson. February 24, 1949. 28p. diagrs., photo., tab. (NACA RM L9A21) (Declassified from Confidential, 8/18/54)

This paper presents the results of an investigation by the transonic-bump method of a wing-fuselage combination employing a wing with the quarter-chord line swept back 45°, with aspect ratio 4, taper ratio 0.6, and an NACA 65A006 airfoil section. Lift, drag, pitching moment, and root bending moment were obtained for the isolated wing and wing-body configurations in a Mach number range between 0.6 and 1.18. Effective downwash angles and dynamic-pressure characteristics in the region of the tail plane were also obtained and are presented for a range of tail heights at one tail length. The effects of two wing-fence arrangements were also investigated.

NACA RM L9A31

STABILITY AND CONTROL DATA OBTAINED FROM FIRST FLIGHT OF X-4 AIRPLANE. Hubert M. Drake. February 7, 1949. 11p. diagrs., photos., tab. (NACA RM L9A31) (Declassified from Confidential, 8/18/54)

Results are presented from the first flight of NACA instrumented Northrop X-4 semitailless research airplane. Data presented include rudder and elevon position, and angle of sideslip for various airspeeds up to 290 miles per hour indicated and 11,000 feet pressure altitude. The airplane exhibited a slight degree of static longitudinal instability for certain conditions.

NACA RM L9B02

FULL-SCALE INVESTIGATION OF A WING WITH THE LEADING EDGE SWEPT BACK 47.5° AND HAVING CIRCULAR-ARC AND FINITE-TRAILING-EDGE-THICKNESS AILERONS. Roy H. Lange. March 11, 1949. 16p. diagrs., photo. (NACA RM L9B02) (Declassified from Confidential, 8/18/54)

The results of an investigation in the Langley full-scale tunnel to determine the aerodynamic characteristics of a wing with the leading edge swept back 47.5° and having a 20-percent-chord, 50-percent-span outboard-flap-type aileron are presented in this paper. The wing had circular-arc airfoil sections, and the aileron was investigated for the circular-arc contour and for a flat-sided contour with finite trailing-edge thickness. The aileron effectiveness was determined and the data are presented for a Reynolds number of 4.3×10^6 and a Mach number of about 0.07.

NACA RM L9B08

SOME WIND-TUNNEL EXPERIMENTS ON SINGLE DEGREE OF FREEDOM FLUTTER OF AILERONS IN THE HIGH SUBSONIC SPEED RANGE. Sherman A. Clevenson. March 30, 1949. 33p. diagrs., photo., 3 tabs. (NACA RM L9B08) (Declassified from Confidential, 8/18/54)

Results of tests of three wing models with various aileron configurations are presented. Density had little effect on the initial magnitude or initial Mach number of buzz. Buzz frequency decreased with decrease of density. Initial buzz Mach number decreases with increasing angle of attack. Mass balancing and changes of spring stiffness of the ailerons in these tests had little effect on buzz. Increasing the aileron mass moment of inertia lowers the buzz frequency. Placing the aileron at the wing tip delays the onset of buzz. A comparison of the test results with two empirical analyses is made.

NACA RM L9B10a

THE EFFECT OF REAR CHINE STRIPS ON THE TAKE-OFF CHARACTERISTICS OF A HIGH-SPEED AIRPLANE FITTED WITH NACA HYDRO-SKIS. John A. Ramsen. March 17, 1949. 7p. diagrs., photo. (NACA RM L9B10a) (Declassified from Confidential, 8/18/54)

Results are presented from tank take-off tests of a dynamic model of a hypothetical high-speed airplane fitted with NACA hydro-skis and having the transverse curvature of the lower rear portion of the fuselage broken by small longitudinal chine strips. For the configuration tested, both trim and resistance were considerably reduced by the addition of the strips from the speed at which the ski emerged to the speed at which the rear of the fuselage came clear of the water. Results indicate that fuselage shape has a large effect on the take-off characteristics for a hydro-ski configuration in which the rear of the fuselage acts as a planing surface.

NACA RM L9B23a

MEASUREMENTS OF AERODYNAMIC CHARACTERISTICS OF A 35° SWEPTBACK NACA 65-009 AIRFOIL MODEL WITH 1/4-CHORD HORN-BALANCED FLAP BY THE NACA WING-FLOW METHOD. Harold I. Johnson and B. Porter Brown. April 18, 1949. 59p. diagrs., photo. (NACA RM L9B23a) (Declassified from Confidential, 8/18/54)

Contains lift, pitching-moment, and hinge-moment data obtained from wing-flow tests of a low-aspect-ratio sweptback airfoil model having a full-span 1/4-chord horn-balanced flap. Mach number range was 0.55 to 1.15. Data are compared with results obtained from previous tests of an equivalent plain-flap model. Conclusion is that horn balance appears satisfactory for $M < 0.95$ but will not be useful between $M \approx 0.95$ and $M = 1.15$.

NACA RM L9B25

AERODYNAMIC CHARACTERISTICS OF A WING WITH QUARTER-CHORD LINE SWEPT BACK 35°, ASPECT RATIO 4, TAPER RATIO 0.6, AND NACA 65A006 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. William C. Sleeman, Jr. and Robert E. Becht. April 21, 1949. 29p. diagrs., photo., tab. (NACA RM L9B25) (Declassified from Confidential, 8/18/54)

This paper presents the results of an investigation by the transonic-bump method of a wing-fuselage combination employing a wing with quarter-chord line swept back 35°, aspect ratio 4, taper ratio 0.6, and NACA 65A006 airfoil section. Lift, drag, pitching moment, and root bending moment were obtained for the wing-alone and wing-body configurations over a Mach number range of 0.6 to 1.18. Effective downwash angles and dynamic-pressure characteristics in the region of a probable tail location were also obtained and are presented for a range of tail heights at one tail length.

NACA RM L9C01

APPARATUS FOR OBTAINING A SUPERSONIC FLOW OF VERY SHORT DURATION AND SOME DRAG MEASUREMENTS OBTAINED WITH ITS USE. John E. Yeates, Jr., F. J. Bailey, Jr. and T. J. Voglewede. July 23, 1951. 23p. diagrs., photos. (NACA RM L9C01) (Declassified from Confidential, 8/18/54)

Contains description of a vacuum-actuated supersonic nozzle and a comparison of drag data obtained from free-fall tests and models tested using this equipment. The comparison indicates that the apparatus gives drag values in good agreement with free-fall, free-flight, and wind-tunnel tests and it should also give good results for comparative drag studies for which this equipment was primarily designed.

NACA RM L9C11

STUDY BY NACA WING-FLOW METHOD OF TRANSONIC DRAG CHARACTERISTICS OF A BLUNT-NOSE BODY OF REVOLUTION AND COMPARISON WITH RESULTS FOR A SHARP-NOSE BODY. J. Ford Johnston and Mitchell Lopatoff. April 26, 1949. 26p. diagrs., photos. (NACA RM L9C11) (Declassified from Confidential, 8/18/54)

Contains studies by NACA wing-flow method of pressure distributions and pressure drag of a body of revolution with NACA 1-50-100 nose inlet at zero inlet flow at Mach numbers from 0.70 to 1.10. Comparison is made with pressure-drag characteristics of a sharp-nose body having same rear end. Consideration of component front- and rear-end drag contributions suggests general picture of body-drag variation in transonic speed range.

NACA RM L9C18

PRESSURE-DISTRIBUTION DATA FOR THE NACA 64_1-012 AND 64_1A012 AIRFOILS AT HIGH SUBSONIC MACH NUMBERS. Milton D. Humphreys. May 6, 1949. 37p. photos., diagrs., 8 tabs. (NACA RM L9C18) (Declassified from Confidential, 8/18/54)

Pressure-distribution tests and schlieren photographs of the NACA $64_1$012 and 64_1A012 airfoils indicated that the primary effect of increasing the trailing-edge angle from 9° to 14° was to decrease the loading over the rear portion of the airfoil. The effect was more pronounced with increasing Mach numbers and lift coefficients.

NACA RM L9C25

ERROR IN AIRSPEED MEASUREMENT DUE TO STATIC-PRESSURE FIELD AHEAD OF SHARP-NOSE BODIES OF REVOLUTION AT TRANSONIC SPEEDS. Edward C. B. Danforth and J. Ford Johnston. August 19, 1949. 31p. diagrs., photos. (NACA RM L9C25) (Declassified from Confidential, 8/18/54)

Contains measurements of static-pressure error at several distances ahead of two sharp-nose bodies of revolution at zero angle of attack in the transonic speed range by the NACA wing-flow method. By application of the linearized subsonic theory and the transonic similarity rule to the data contained herein, the position error at any reasonable distance ahead of any sharp-nose body of revolution with an approximately parabolic nose profile and fineness ratio greater than about 4.5 can be predicted at any Mach number.

NACA RM L9D01

PRELIMINARY WIND-TUNNEL INVESTIGATION AT HIGH-SUBSONIC SPEEDS OF PLANING-TAIL, BLENDED, AND AIRFOIL-FOREBODY SWEPT HULLS. John M. Riebe and Richard G. MacLeod. September 12, 1949. 33p. diagrs., photos., 3 tabs. (NACA RM L9D01) (Declassified from Confidential, 8/23/54)

A preliminary investigation was made in the Langley high-speed 7- by 10-foot tunnel to determine the high subsonic aerodynamic characteristics of three different types of flying-boat hull: namely, a planing-tail hull, a blended hull, and an airfoil-forebody swept hull. For comparative purposes a body of revolution representative of the fuselage of a modern high-speed airplane was also included. The hull and fuselage data presented include the forces and moments of a 51.3° sweptback wing; the models were tested as reflection-plane half-models on the side wall of the tunnel. The results include the lift, drag, and pitching-moment coefficients through angles of attack from -1° to 4° up to Mach numbers to 0.99.

NACA RM L9D06

WIND-TUNNEL INVESTIGATION AT HIGH SUBSONIC SPEEDS OF THE LATERAL-CONTROL CHARACTERISTICS OF AN AILERON AND A STEPPED SPOILER ON A WING WITH LEADING EDGE SWEPT BACK 51.3°. Leslie E. Schneiter and John R. Hagerman. June 7, 1949. 34p. diagrs., photo. (NACA RM L9D06) (Declassified from Confidential, 8/18/54)

Contains results and discussion of an investigation to a Mach number of about 0.9 of the lateral-control characteristics of a 20-percent-chord by 39-percent-semispan plain sealed aileron and a 60-percent-span stepped spoiler on a semispan-wing model of aspect ratio 3.0 and leading edge swept back 51.3°. The general wing aerodynamic characteristics were also determined in this investigation.

NACA RM L9D06a

MEASUREMENT OF THE DYNAMIC LATERAL STABILITY OF THE DOUGLAS D-558-1 AIRPLANE (BUAERO NO. 37971) IN RUDDER KICKS AT A MACH NUMBER OF 0.72. Hubert M. Drake. May 31, 1949. 10p. diagrs., photos. (NACA RM L9D06a) (Declassified from Confidential, 8/18/54)

Contains results of flight measurements of the dynamic lateral stability of the Douglas D-558-1 airplane at a Mach number of 0.72 and a pressure altitude of 8500 feet.

NACA RM L9D07

INVESTIGATIONS AT SUPERSONIC SPEEDS OF 22 TRIANGULAR WINGS REPRESENTING TWO AIRFOIL SECTIONS FOR EACH OF 11 APEX ANGLES. Eugene S. Love. May 10, 1949. 100p. diagrs., photos., 3 tabs. (NACA RM L9D07) (Declassified from Confidential, 8/18/54)

The results of tests of 22 triangular wings, representing two leading-edge shapes for each of 11 apex angles, at Mach numbers of 1.62, 1.92, and 2.40 are presented and compared with theory. All wings have a common thickness ratio of 8 percent and a common location of maximum thickness point of 18 percent. Lift, drag, and pitching moment are given for all wings at each Mach number. The relation of transition in the boundary layer, shocks on the wing surfaces, and characteristics of the pressure distributions is discussed for several wings.

NACA RM L9D11

FLIGHT INVESTIGATION OF THE JETTISONABLE-NOSE METHOD OF PILOT ESCAPE USING ROCKET-PROPELLED MODELS. Reginald R. Lundstrom and Burke R. O'Kelly. June 2, 1949. 27p. diagrs., photos., 2 tabs. (NACA RM L9D11) (Declassified from Confidential, 8/18/54)

Results of an investigation at a Mach number of 0.87 of the jettisonable-nose method of pilot escape, using rocket-propelled models, is presented. With a fin-stablized nose section the accelerations produced are well within human tolerance. The drag-weight ratios of nose and rear bodies were such that the deceleration of the nose was less than that of the rear body. The shielding effect of the nose on the rear body was appreciable, and forcible separation appears necessary.

NACA RM L9D13

MEASUREMENTS OF AILERON EFFECTIVENESS OF BELL X-1 AIRPLANE UP TO A MACH NUMBER OF 0.82. Hubert M. Drake. June 20, 1949. 7p. diagrs. (NACA RM L9D13) (Declassified from Confidential, 8/18/54)

Contains results of flight measurements of the aileron effectiveness of the Bell X-1 airplane up to a Mach number of 0.82. The data indicate that Mach number has little effect on the aileron effectiveness up to a Mach number of 0.82.

NACA RM L9D20

THE EFFECT OF AIR-JET AND STRIP MODIFICATIONS ON THE HYDRODYNAMIC CHARACTERISTICS OF THE STREAMLINE FUSELAGE OF A TRANSONIC AIRPLANE. Bernard Weinflash, Kenneth W. Christopher and Charles L. Shuford, Jr. June 3, 1949. 32p. diagrs., photos. (NACA RM L9D20) (Declassified from Confidential, 8/18/54)

Specific free-to-trim tests were made on a 1/12-size model of a streamline fuselage modified by patterns of air jets or strips on the fuselage bottom. The effects of spacing of jets, length of jet rows, and direction of jets were determined for a simulated chine configuration. Tests were also made of a

simulated multiple-step configuration. The effect of air flow on both the chine and step configurations was studied. In addition, the effect of substituting narrow breaker strips for the rows of jets in the chine configuration and in three multiple-step configurations was investigated. Data are presented on resistance, trim, effective hydrodynamic lift, and spray.

NACA RM L9D20a

MEASURED CHARACTERISTICS OF THE DOUGLAS D-558-1 AIRPLANE (BUAERO NO. 37971) IN TWO LANDINGS. Hubert M. Drake. June 3, 1949. 8p. diagrs., photos. (NACA RM L9D20a) (Declassified from Confidential, 8/18/54)

Records were obtained of two landings which indicate approach and landing speeds of 150 and 115 percent of the estimated minimum speed. The rates of descent just prior to the start of the landing flare were about 1200 to 1800 feet per minute.

NACA RM L9E10

EFFECTS OF MACH NUMBER AND SWEEP ON THE DAMPING-IN-ROLL CHARACTERISTICS OF WINGS OF ASPECT RATIO 4. Richard E. Kuhn and Boyd C. Myers, II. June 27, 1949. 28p. diagrs., photo. (NACA RM L9E10) (Declassified from Confidential, 8/18/54)

The damping-in-roll characteristics of three wings of aspect ratio 4 and taper ratio 0.6 with sweep angles of 3.6°, 32.6°, and 46.7° at the quarter-chord line and the NACA 65A006 section have been determined through the Mach number range from 0.4 to 0.91 and angle-of-attack range from 0° to 6.5° in the Langley high-speed 7- by 10-foot tunnel by the free-roll method. Rolling-moment and rate-of-roll data for each wing are presented for an angle-of-attack range from 0° to 6.5° and aileron angles of 0°, ±4°, and ±8°. Aileron effectiveness and the damping-in-roll parameter C_{l_p} are presented for these conditions along with a comparison with theory.

NACA RM L9E19

AERODYNAMIC CHARACTERISTICS OF SEVERAL 6-PERCENT-THICK AIRFOILS AT ANGLES OF ATTACK FROM 0° TO 20° AT HIGH SUBSONIC SPEEDS. Bernard N. Daley and Douglas R. Lord. July 14, 1949. 63p. diagrs., photos. (NACA RM L9E19) (Declassified from Confidential, 8/18/54)

Gives aerodynamic characteristics obtained from experimental two-dimensional tests of eight 6-percent-thick symmetrical airfoils of the supersonic and subsonic type at angles of attack from 0° to 20° and at Mach numbers from 0.3 to about 0.9. Results indicate generally improved characteristics for the circular-arc and wedge-type airfoils when the maximum thickness was located forward. The variations with Mach number of the lift, drag, and pitching-moment coefficients are generally similar for the supersonic- and subsonic-type airfoils tested.

NACA RM L9E25

AERODYNAMIC CHARACTERISTICS OF A WING WITH QUARTER-CHORD LINE SWEPT BACK 45°, ASPECT RATIO 4, TAPER RATIO 0.3, AND NACA 65A006 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. Boyd C. Myers, II and Thomas J. King, Jr. July 20, 1949. 28p. diagrs., photo., tab. (NACA RM L9E25) (Declassified from Confidential, 8/18/54)

This paper presents the results of an investigation by the transonic-bump method of a wing-fuselage combination employing a wing with quarter-chord line swept back 45° with aspect ratio 4, taper ratio 0.3, and NACA 65A006 airfoil. Lift, drag, pitching moment, and root bending moment were obtained for the isolated wing and wing-fuselage configurations over a Mach number range 0.70 to 1.18. Effective downwash angles and dynamic-pressure characteristics in the region of the tail plane were also obtained and are presented for a range of tail heights at one tail length. In order to expedite publishing of these data only a brief analysis has been made.

NACA RM L9F14

EFFECT OF SWEEPBACK ON THE LOW-SPEED STATIC AND ROLLING STABILITY DERIVATIVES OF THIN TAPERED WINGS OF ASPECT RATIO 4. William Letko and Walter D. Wolhart. August 9, 1949. 36p. diagrs., photo. (NACA RM L9F14) (Declassified from Confidential, 8/18/54)

Contains results of an investigation made in the rolling-flow test section of the Langley stability tunnel to determine the effects of sweepback on the static and rolling derivatives of a series of wings each of which had a taper ratio of 0.6 and an aspect ratio of 4. The wings were of NACA 65A006 section and had sweepback angles of their quarter-chord line of 3.6°, 32.6°, and 46.7°. Most of the results are for wings tested in combination with a fuselage. The damping-in-roll results are compared with those obtained from free rotation of the models in the Langley 7- by 10-foot tunnel, and some comparisons are made with theory.

NACA RM L9F15

DAMPING-IN-ROLL CHARACTERISTICS OF A 42.7° SWEPT-BACK WING AS DETERMINED FROM A WIND-TUNNEL INVESTIGATION OF A TWISTED SEMISPAN WING. Vernard E. Lockwood. August 8, 1949. 23p. diagrs. (NACA RM L9F15) (Declassified from Confidential, 8/18/54)

This paper presents the results of a damping-in-roll investigation of a sweptback wing as determined from tunnel tests of a twisted semispan wing. The wing of the investigation had a leading-edge sweep of 42.7°, a taper ratio of 0.5, an aspect ratio of 4.0, and a circular-arc airfoil section normal to the 50-percent chord line. The tests were made in the transonic speed range between Mach numbers 0.6 and 1.15 in the Langley high-speed 7- by 10-foot tunnel by utilizing the transonic bump and at a Mach number of 1.9 in the Langley 9- by 12-inch supersonic blowdown tunnel.

NACA RM L9F21

RESULTS OBTAINED FROM SECOND FLIGHT OF X-4 AIRPLANE (A.F. NO. 46-676). Walter C. Williams. July 18, 1949. 13p. diagrs., photos., tab. (NACA RM L9F21) (Declassified from Confidential, 8/18/54)

Results are presented from the second flight of the NACA instrumented Northrop X-4 semitailless research airplane. Data presented include static-longitudinal-stability measurements and a time history of a landing approach and landing with the center of gravity at 19.7 percent mean aerodynamic chord. The airplane exhibited positive static longitudinal stability and low damping of the lateral oscillation.

NACA RM L9F28a

AN NACA VANE-TYPE ANGLE-OF-ATTACK INDICATOR FOR USE AT SUBSONIC AND SUPERSONIC SPEEDS. Jesse L. Mitchell and Robert F. Peck. August 16, 1949. 10p. diagrs., photos. (NACA RM L9F28a) (Declassified from Confidential, 8/18/54)

A description is presented of a vane-type angle-of-attack indicator developed by the NACA for use at supersonic and subsonic speeds. A brief history of the development and a wind-tunnel calibration are given, together with a discussion of the corrections to be applied to the indicated readings.

NACA RM L9F29

TESTS OF LIFTING SURFACES ON CONICAL AND CYLINDRICAL PORTIONS OF A BODY AT SUBSONIC MACH NUMBERS AND AT A MACH NUMBER OF 1.2. Robert S. Osborne and John B. Wright. September 2, 1949. 22p. diagrs. (NACA RM L9F29) (Declassified from Confidential, 8/18/54)

Tests have been conducted at a Mach number of 1.2 and at several subsonic speeds to determine the possibilities of using a subsonic conical-flow field in a supersonic free stream to delay the onset of adverse compressibility effects on lifting surfaces.

NACA RM L9F29a

LATERAL-CONTROL INVESTIGATION OF FLAP-TYPE CONTROLS ON A WING WITH QUARTER-CHORD LINE SWEPT BACK 45°, ASPECT RATIO 4, TAPER RATIO 0.6, AND NACA 65A006 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. Raymond D. Vogler. August 15, 1949. 22p. diagrs. (NACA RM L9F29a) (Declassified from Confidential, 8/18/54)

This paper presents the results of a lateral-control investigation of a 30-percent-chord flap-type control of various spanwise magnitudes on a wing of 45° of sweepback of the quarter-chord line, an aspect ratio of 4, a taper ratio of 0.6, and an NACA 65A006 airfoil section. Rolling and pitching moments and lift of the semispan wing fuselage were obtained through a Mach number range of 0.6 to 1.20.

NACA RM L9G06a

INVESTIGATION OF THE NACA 4-(5)(08)-03 TWO-BLADE PROPELLER AT FORWARD MACH NUMBERS TO 0.925. James B. Delano and Melvin M. Carmel. September 15, 1949. 61p. diagrs., photo. (NACA RM L9G06a) (Declassified from Confidential, 8/23/54)

The paper presents propeller characteristics for the NACA 4-(5)(08)-03 two-blade propeller for forward Mach numbers up to 0.925 for blade angles from 20° to 70°.

NACA RM L9G20a

RESULTS OBTAINED FROM THIRD FLIGHT OF NORTHROP X-4 AIRPLANE (A.F. NO. 46-676). Walter C. Williams. September 9, 1949. 13p. diagrs., photos., tab. (NACA RM L9G20a) (Declassified from Confidential, 8/18/54)

Results are presented from the third flight of the NACA instrumented Northrop X-4 semitailless research airplane. Data presented are steady sideslip characteristics at 175 miles per hour which show that directional stability is positive and high and lateral stability is positive.

NACA RM L9G22

THE STATIC-PRESSURE ERROR OF WING AND FUSELAGE AIRSPEED INSTALLATIONS OF THE X-1 AIRPLANES IN TRANSONIC FLIGHT. Harold R. Goodman and Roxanah B. Yancey. July 22, 1949. 20p. diagrs. (NACA RM L9G22) (Declassified from Confidential, 8/18/54)

Contains measurements of the static-pressure error of the airspeed installations of the X-1 airplanes obtained from flight tests made in the Mach number range of 0.8 to 1.32. The static-pressure error was measured at a point ahead of the fuselage nose and at a point ahead of the wing tip. Data are presented showing the variation of the static-pressure error with Mach number, airplane lift coefficient, and wing thickness.

NACA RM L9G22a

AERODYNAMIC CHARACTERISTICS OF A DELTA WING WITH LEADING EDGE SWEPT BACK 45°, ASPECT RATIO 4, AND NACA 65A006 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. William C. Sleeman, Jr. and Robert E. Becht. September 6, 1949. 29p. diagrs., photo., tab. (NACA RM L9G22a) (Declassified from Confidential, 8/18/54)

This paper presents the results of an investigation by the transonic-bump method of a wing-fuselage combination employing a delta wing with leading edge swept back 45°, aspect ratio 4, and an NACA 65A006 airfoil section. Lift, drag, pitching moment, and root bending moment were obtained for the wing-alone and wing-fuselage configurations over a Mach number range of 0.60 to 1.18. Effective downwash angles and dynamic-pressure characteristics in the region of a probable tail location were also obtained and are presented for a range of tail heights at one tail length.

NACA RM L9G25a

STABILITY AND CONTROL DATA OBTAINED FROM FOURTH AND FIFTH FLIGHTS OF THE NORTHROP X-4 AIRPLANE (A.F. NO. 46-676). George M. Valentine. August 4, 1949. 22p. diagrs., photos., tab. (NACA RM L9G25a) (Declassified from Confidential, 8/18/54)

Results are presented from the fourth and fifth flights of the NACA instrumented Northrop X-4 semitailless research airplane. Data presented from steady level runs from 140 to 340 miles per hour which showed the airplane to be longitudinally stable, stick fixed, in the clean configuration and in the gear-down flaps-retracted configuration. Data also are presented from steady sideslip characteristics at 175 to 280 miles per hour which show that the directional stability is positive and high and lateral stability is positive.

NACA RM L9G27

AERODYNAMIC CHARACTERISTICS OF A WING WITH QUARTER-CHORD LINE SWEPT BACK 60°, ASPECT RATIO 4, TAPER RATIO 0.6, AND NACA 65A006 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. Thomas J. King, Jr. and Boyd C. Myers, II. September 6, 1949. 32p. diagrs., photos., tab. (NACA RM L9G27) (Declassified from Confidential, 8/18/54)

The paper presents the results of an investigation by the transonic-bump method of a wing-fuselage combination employing a wing with quarter-chord line swept back 60° with aspect ratio 4, taper ratio 0.6, and 65A006 airfoil. Lift, drag, pitching-moment, and root-bending moment characteristics were obtained for the isolated-wing and wing-fuselage configurations over a Mach number range from 0.60 to 1.18. In addition, the effect of a fence, mounted at the mean aerodynamic chord, is also discussed. Effective downwash angles and dynamic-pressure characteristics in the region of the tail plane were also obtained and are presented for a range of tail heights at one tail length. In order to expedite publishing of these data only a brief analysis has been made.

NACA RM L9H04

INVESTIGATION OF EXTENSIBLE WING-TIP AILERONS ON AN UNTAPERED SEMISPAN WING AT 0° AND 45° SWEEPBACK. John R. Hagerman and William M. O'Hare. September 20, 1949. 40p. diagrs., photo., tab. (NACA RM L9H04) (Declassified from Confidential, 8/18/54)

Contains results and discussion of a low-speed lateral control investigation of three different plan forms of extensible wing-tip ailerons on each of two untapered wing configurations, one unswept with aspect ratio of 3.13 and the other swept back 45° with aspect ratio of 1.59. The results indicate that the extensible ailerons had satisfactory rolling effectiveness at moderate and high values of lift coefficient but insufficent rolling effectiveness at low values of lift coefficient for satisfactory application to an airplane. However, these ailerons may be suitable for use on some types of missiles. The extensible ailerons produced yawing moments comparable to those produced by conventional flap-type ailerons.

NACA RM L9H16

WIND-TUNNEL INVESTIGATION AT LOW TRANSONIC SPEEDS OF THE EFFECTS OF NUMBER OF WINGS ON THE LATERAL-CONTROL EFFECTIVENESS OF AN RM-5 TEST VEHICLE. Harold S. Johnson. November 29, 1949. 15p. diagrs., photo., tab. (NACA RM L9H16) (Declassified from Confidential, 8/18/54)

Contains results of a wind-tunnel investigation conducted to determine the effects of number of wings on the rolling characteristics of an RM-5 test vehicle through a speed range to a Mach number of 0.9.

NACA RM L9H22

AERODYNAMIC CHARACTERISTICS OF A WING WITH UNSWEPT QUARTER-CHORD LINE, ASPECT RATIO 4, TAPER RATIO 0.6, AND NACA 65A006 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. Kenneth W. Goodson and William D. Morrison, Jr. October 21, 1949. 32p. diagrs., photos., tab. (NACA RM L9H22) (Declassified from Confidential, 8/18/54)

This paper presents the results of an investigation by the transonic-bump method of a wing-fuselage combination employing a wing with unswept quarter-chord line, aspect ratio 4, taper ratio 0.6, and NACA 65A006 airfoil section. Lift, drag, pitching moment, and root bending moment were obtained for the wing-alone and wing-body configurations over a Mach number range of 0.6 to 1.18. Effective downwash angles and dynamic-pressure characteristics in the region of the tail plane were also obtained and are presented for a range of tail heights at one tail length.

NACA RM L9H29a

INVESTIGATION OF SOME TURBULENT-BOUNDARY-LAYER VELOCITY PROFILES AT A TUNNEL WALL WITH MACH NUMBERS UP TO 1.2. Marshall P. Tulin and Ray H. Wright. November 9, 1949. 22p. diagrs. (NACA RM L9H29a) (Declassified from Confidential, 8/18/54)

Turbulent-boundary-layer profiles at large Reynolds numbers, of the order of 40,000 based on the momentum thickness, and at Mach numbers up to 1.2 are presented and analyzed. The effects of compressibility on the profiles and on the displacement and momentum thicknesses are discussed. The turbulent boundary layer under a normal shock is investigated.

NACA RM L9I01

A FREE-FLIGHT TECHNIQUE FOR MEASURING DAMPING IN ROLL BY USE OF ROCKET-POWERED MODELS AND SOME INITIAL RESULTS FOR RECTANGULAR WINGS. James L. Edmondson and E. Claude Sanders, Jr. December 20, 1949. 25p. diagrs., photos. (NACA RM L9I01) (Declassified from Confidential, 8/18/54)

A simplified method for obtaining damping in roll experimentally at transonic and supersonic speeds through use of a simple rocket-powered model employing canted nozzles to apply a torque has been developed. A description of the method and results of the initial flight tests of rectangular wings with aspect ratio 3.71 are presented.

NACA RM L9I06

INVESTIGATION OF THE NACA 4-(3)(08)-03 TWO-BLADE PROPELLER AT FORWARD MACH NUMBERS TO 0.925. James B. Delano and Francis G. Morgan, Jr. November 2, 1949. 30p. diagrs., photos. (NACA RM L9I06) (Declassified from Confidential, 8/23/54)

Propeller characteristics are presented for the NACA 4-(3)(08)-03 blade propeller for forward Mach numbers up to 0.925 for blade angles of 55°, 60°, and 65°. A comparison of results for this propeller with those for the NACA 4-(5)(08)-03 propeller is presented to show the effect of design camber on propeller performance.

NACA RM L9I06a

STATIC STABILITY OF FUSELAGE HAVING A RELATIVELY FLAT CROSS SECTION. William R. Bates. December 9, 1949. 29p. diagrs., tab. (NACA RM L9I06a) (Declassified from Confidential, 8/18/54)

Contains results of force tests and flow surveys made in the Langley free-flight tunnel to determine the static stability characteristics of several fuselages having a relatively flat cross section and a high fineness ratio.

NACA RM L9I07

INVESTIGATION OF THE NACA 4-(4)(06)-04 TWO-BLADE PROPELLER AT FORWARD MACH NUMBERS TO 0.925. James B. Delano and Daniel E. Harrison. October 28, 1949. 39p. diagrs., photos. (NACA RM L9I07) (Declassified from Confidential, 8/23/54)

The paper presents propeller characteristics for the NACA 4-(4)(06)-04 two-blade propeller for forward Mach numbers up to 0.925 for blade angles from 20° to 70°.

NACA RM L9I08

AERODYNAMIC CHARACTERISTICS OF A WING WITH QUARTER-CHORD LINE SWEPT BACK 45°, ASPECT RATIO 6, TAPER RATIO 0.6, AND NACA 65A006 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. Kenneth W. Goodson and Albert G. Few, Jr. November 1, 1949. 34p. diagrs., photos., tab. (NACA RM L9I08) (Declassified from Confidential, 8/18/54)

This paper presents the results of an investigation by the transonic-bump method of a wing-alone and a wing-fuselage combination employing a wing with quarter-chord line swept back 45°, aspect ratio 6, taper ratio 0.6, and NACA 65A006 airfoil section. Lift, drag, pitching moment, and root bending moment were obtained for the wing-alone and wing-fuselage configurations over a Mach number range from 0.60 to 1.18. Effective downwash angles and dynamic-pressure characteristics in the region of the tail plane were also obtained and are presented for a range of tail heights at one tail length.

NACA RM L9I28

AN EMPIRICAL CRITERION FOR FIN STABILIZING JETTISONABLE NOSE SECTIONS OF AIRPLANES. Stanley H. Scher. December 8, 1949. 21p. diagrs., photo., tab. (NACA RM L9I28) (Declassified from Confidential, 8/18/54)

The present paper summarizes the results of investigations in the Langley 20-foot free-spinning tunnel which show the inherent instability of models of jettisonable nose sections. A criterion is presented from which, for a given center-of-gravity position, the fin area required for stabilization of airplane nose sections can be determined.

NACA RM L9J04

EFFECT OF AIRFOIL SECTION AND TIP TANKS ON THE AERODYNAMIC CHARACTERISTICS AT HIGH SUBSONIC SPEEDS OF AN UNSWEPT WING OF ASPECT RATIO 5.16 AND TAPER RATIO 0.61. H. Norman Silvers and Kenneth P. Spreemann. December 1, 1949. 30p. diagrs., photos., 2 tabs. (NACA RM L9J04) (Declassified from Confidential, 8/18/54)

An investigation of a wing of aspect ratio 5.16 and of taper ratio 0.61 with two airfoil sections and a tip tank was made in the Langley high-speed 7- by 10-foot tunnel over a Mach number range that generally extended from 0.60 to 0.90. In addition to the effect of airfoil section and tip tank on the lift, drag, and pitching-moment coefficients of the wing alone and the wing-tank combination, tests included the effect of two modifications to the trailing edge of one section and horizontal stabilizing fins on the tip tank. Pitching moment and lift of the tank alone in the presence of the wing with one airfoil section were also measured.

NACA RM L9J05

INVESTIGATION AT MACH NUMBER 1.62 OF THE PRESSURE DISTRIBUTION OVER A RECTANGULAR WING WITH SYMMETRICAL CIRCULAR-ARC SECTION AND 30-PERCENT-CHORD TRAILING-EDGE FLAP. K. R. Czarnecki and James N. Mueller. January 25, 1950. 81p. diagrs., photos. (NACA RM L9J05) (Declassified from Confidential, 8/23/54)

Contains the results of an investigation at a Mach number of 1.62 and a Reynolds number range of 0.55 to 1.07×10^6 of the pressure distributions over a rectangular wing having a 9-percent-thick circular-arc section and a 30-percent-chord trailing-edge flap. The characteristics of the air flow at two spanwise stations, one in the two-dimensional flow region and the other in the region influenced by the airfoil tip, are discussed.

NACA RM L9J13

WIND-TUNNEL INVESTIGATION AT LOW SPEED TO DETERMINE AERODYNAMIC PROPERTIES OF A JETTISONABLE NOSE SECTION WITH CIRCULAR CROSS SECTION. Roscoe H. Goodwin. May 19, 1950. 38p. diagrs., photos. (NACA RM L9J13) (Declassified from Confidential, 8/23/54)

The aerodynamic properties of a model of a jettisonable nose section with a circular cross section were determined at low speed from an investigation in the Langley 20-foot free-spinning tunnel. Force and moment measurements were made of the nose section in various positions removed from the fuselage and in a position simulating its final condition of free fall (not under the influence of the fuselage). For each location of the nose, the measurements were obtained for the nose with and without stabilizing fins attached for 0° and 5° angle of attack.

NACA RM L9J13a

THE PATH AND MOTION OF SCALE MODELS OF JETTISONABLE NOSE SECTIONS AT SUPERSONIC SPEEDS AS DETERMINED FROM AN INVESTIGATION IN THE LANGLEY FREE-FLIGHT APPARATUS. Lawrence J. Gale. May 23, 1950. 35p. diagrs., photos., 2 tabs. (NACA RM L9J13a) (Declassified from Confidential, 8/23/54)

An investigation has been conducted on models of two different designs of jettisonable nose sections wherein the nose sections have been projected at supersonic speeds (Mach number ranged from 1.2 to 1.4) in the Langley free-flight apparatus. Both nose designs in the original unstabilized condition turned away from a nose-first flight attitude and calculations indicated that a pilot within corresponding full-scale nose sections would encounter large accelerations (12 negative g for 0.014 sec for one nose design and 26 negative g for 0.013 sec for the other design) as a result of this instability. Both nose designs with fins installed appeared stable, and calculations indicated that the equivalent motion in a corresponding full-scale nose section would not subject the pilot to large accelerations (6 transverse g).

NACA RM L9J19

THE EFFECT OF TIP TANKS ON THE ROLLING CHARACTERISTICS AT HIGH SUBSONIC MACH NUMBERS OF A WING HAVING AN ASPECT RATIO OF 3 WITH QUARTER-CHORD LINE SWEPT BACK 35°. Richard E. Kuhn and Boyd C. Myers, II. January 17, 1950. 27p. diagrs., photo., 2 tabs. (NACA RM L9J19) (Declassified from Confidential, 8/23/54)

An investigation of the effect of two wing-tip mounted tank configurations on the rolling characteristics of a swept wing through the Mach number range from 0.4 to 0.91 and in the angle-of-attack range from 0.3° to 6.5° was conducted by the free-roll method. An additional tank configuration was tested through the Mach number range at a constant angle of attack of 0.3°. Tanks mounted directly on the tip increased both the aileron effectiveness and the damping in roll. Pylon-mounted tanks gave a much smaller increase in both of these quantities. The variation of damping in roll with Mach number was similar and slightly greater than the wing alone for all configurations tested at a constant angle of attack of 0.3°.

NACA RM L9J27

MEASUREMENTS OF THE DRAG AND PRESSURE DISTRIBUTION ON A BODY OF REVOLUTION THROUGHOUT TRANSITION FROM SUBSONIC TO SUPERSONIC SPEEDS. Jim Rogers Thompson. January 16, 1950. 36p. diagrs., photos., 2 tabs. (NACA RM L9J27) (Declassified from Confidential, 8/23/54)

The drag and pressure distribution on a body of revolution of fineness ratio 12 were measured by the free-fall method at large scale under actual flight conditions throughout a range of Mach number from 0.75 to 1.27. Analysis shows in detail the mechanism of the abrupt drag rise which occurs near the speed of sound and demonstrates that the theoretical method of NACA TN 1768 satisfactorily predicts the shape of the pressure distribution over the test body at supersonic speeds. Limited information on skin friction is presented.

NACA RM L9K02

INVESTIGATION OF EFFECT OF SPAN AND SPANWISE LOCATION OF PLAIN AND STEPPED SPOILER AILERONS ON LATERAL CONTROL CHARACTERISTICS OF A WING WITH LEADING EDGE SWEPT BACK 51.3°. Jack Fischel and Alexander D. Hammond. January 18, 1950. 59p. diagrs., photos. (NACA RM L9K02) (Declassified from Confidential, 8/23/54)

Contains results and discussion of a low-speed lateral control investigation of a 51.3° sweptback wing equipped with plain and stepped spoiler ailerons having various spans and spanwise locations. The various ailerons were tested on the wing alone and on the wing with a simulated fuselage, an 0.487-span drooped nose, an 0.487-span split flap, and with various combinations thereof through a large angle-of-attack range.

NACA RM L9K03

MAXIMUM-LIFT INVESTIGATION AT MACH NUMBERS FROM 0.05 TO 1.20 OF A WING WITH LEADING EDGE SWEPT BACK 42°. Thomas R. Turner. February 14, 1950. 21p. diagrs. (NACA RM L9K03) (Declassified from Confidential, 8/23/54)

This paper contains the aerodynamic characteristics in pitch up to maximum lift for a reflection-plane model having 42° leading-edge sweep, an aspect ratio of 4, and a taper ratio of 0.625. The Mach number varied from 0.05 to 1.20 with the Reynolds number varying from 350,000 to 5,000,000. The higher Mach numbers were obtained by means of the transonic bump.

NACA RM L9K04a

A STUDY OF THE DYNAMIC STABILITY OF THE BELL X-1 RESEARCH AIRPLANE. Edward C. Polhamus. January 10, 1950. 16p. diagrs., tab. (NACA RM L9K04a) (Declassified from Confidential, 8/23/54)

The period and damping of the lateral oscillation of the Bell X-1 research airplane have been calculated for a range of Mach numbers and wing loadings for an altitude of 30,000 feet. The effect of changes in the magnitude of some of the parameters has been investigated and a comparison with flight results has been made.

NACA RM L9K11

MEASUREMENTS OF AERODYNAMIC CHARACTERISTICS OF A 35° SWEPTBACK NACA 65-009 AIRFOIL MODEL WITH 1/4-CHORD BEVELLED-TRAILING-EDGE FLAP AND TRIM TAB BY THE NACA WING-FLOW METHOD. Harold I. Johnson and B. Porter Brown. January 6, 1950. 68p. diagrs., photo. (NACA RM L9K11) (Declassified from Confidential, 8/23/54)

Contains lift, pitching-moment, and hinge-moment data from wing-flow tests of a low-aspect-ratio sweptback airfoil model having a full-span 1/4-chord bevelled-trailing-edge flap. Mach number range was 0.55 to 1.15. Conclusion is that bevelled trailing edge is undesirable type of aerodynamic balance for large speed range because of nonuniform balancing characteristics at subsonic speeds and loss of balancing effectiveness at low supersonic speeds.

NACA RM L9K22

RESULTS OBTAINED DURING FLIGHTS 1 TO 6 OF THE NORTHROP X-4 AIRPLANE (A.F. NO. 46-677). James T. Matthews, Jr. January 12, 1950. 19p. diagrs., photos., tab. (NACA RM L9K22) (Declassified from Confidential, 8/23/54)

Results are presented for flights 1 to 6 of a Northrop X-4 number 2 semitailless research airplane (A.F. No. 46-677) equipped with NACA instruments. Data presented include time histories of a complete pull-up and several short runs in level and accelerated flight, and the effect of dive-brake extension on longitudinal and lateral trim extension.

NACA RM L9K28

AN INVESTIGATION OF THE SPIN, RECOVERY, AND TUMBLING CHARACTERISTICS OF A 1/20-SCALE MODEL OF THE NORTHROP X-4 AIRPLANE. Lawrence J. Gale, Ira P. Jones, Jr. and Jack H. Wilson. January 4, 1950. 27p. diagrs., photos., 4 tabs. (NACA RM L9K28) (Declassified from Confidential, 8/23/54)

An investigation of the spin, recovery, and tumbling characteristics of a 1/20-scale model of the Northrop X-4 airplane has been conducted in the Langley 20-foot free-spinning tunnel. The effects of control settings and movements upon the erect and inverted spin and recovery characteristics of the model were determined for the model for loading conditions simulating various degrees of exhaustion of fuel in the airplane. An investigation was also made to determine the spin-recovery parachute requirements.

NACA RM L9L05

INVESTIGATION OF THE NACA 4-(4)(06)-057-45A AND NACA 4-(4)(06)-057-45B TWO-BLADE SWEPT PROPELLERS AT FORWARD MACH NUMBERS TO 0.925. James B. Delano and Daniel E. Harrison. February 6, 1950. 44p. diagrs., photos. (NACA RM L9L05) (Declassified from Confidential, 8/23/54)

The paper presents propeller characteristics for the NACA 4-(4)(06)-057-45A and NACA 4-(4)(06)-057-45B two-blade swept propellers for forward Mach numbers up to 0.925 for blade angles of 25°, 55°, 60°, 65°, and 70°. Moderate delays in onset of adverse compressibility effects were obtained through use of large amounts of sweep. The measured delay was approximately 25 percent of the value predicted by the use of simple infinite-span sweep theory.

NACA RM L9L08a

MOTION OF A TRANSONIC AIRPLANE NOSE SECTION WHEN JETTISONED AS DETERMINED FROM WIND-TUNNEL INVESTIGATIONS ON A 1/25-SCALE MODEL. Stanley H. Scher and Lawrence J. Gale. May 26, 1950. 64p. diagrs., photos., tab. (NACA RM L9L08a) (Declassified from Confidential, 8/23/54)

An investigation has been conducted with a 1/25-scale model in the Langley 300 mph 7- by 10-foot tunnel, the Langley free-flight tunnel, and the Langley 20-foot free-spinning tunnel to determine the path and motion of a transonic airplane nose section when jettisoned. The investigation included determination of the probable accelerations that would act on a pilot in the jettisoned nose section.

NACA RM L9L12

PRESSURE DISTRIBUTIONS ON THE BLADE SECTIONS OF THE NACA 10-(3)(066)-033 PROPELLER UNDER OPERATING CONDITIONS. Julian D. Maynard and Maurice P. Murphy. January 24, 1950. 166p. diagrs., photos., 12 tabs. (NACA RM L9L12) (Declassified from Confidential, 8/23/54)

Contains preliminary data obtained by measuring the pressure distributions on eleven blade sections of the NACA 10-(3)(066)-033 propeller having section design lift coefficients of 0.3 and varying in thickness from about 4 percent at the tip to 16 percent at the spinner surface. The pressure distributions

together with the corresponding section normal-force coefficients, chordwise-pressure-force coefficients, and pitching-moment coefficients are presented in the form of tables for a range of angle of attack from about -2° to 11° and for a Mach number range from about 0.3 to 1.2.

NACA RM L9L12a

LATERAL-CONTROL INVESTIGATION OF FLAP-TYPE CONTROLS ON A WING WITH QUARTER-CHORD LINE SWEPT BACK 35°, ASPECT RATIO 4, TAPER RATIO 0.6, AND NACA 65A006 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. Robert F. Thompson. January 25, 1950. 22p. diagrs., tab. (NACA RM L9L12a) (Declassified from Confidential, 8/23/54)

This paper presents the results of an investigation to determine the control-effectiveness characteristics of 30-percent-chord flap-type control surfaces of various spans on a semispan wing-fuselage model by the transonic-bump method. The model employed a wing with the quarter-chord line swept back 35°, an aspect ratio of 4, a taper ratio of 0.6, and an NACA 65A006 airfoil section parallel to the free stream. Rolling moments, pitching moments, and lift were obtained through a Mach number range of 0.6 to 1.20.

NACA RM L9L15

THE TIME LAG BETWEEN FLAP DEFLECTION AND FORCE DEVELOPMENT AT A MACH NUMBER OF 4. Walter F. Lindsey and Edward F. Ulmann. February 13, 1950. 11p. diagr., photos. (NACA RM L9L15) (Declassified from Confidential, 8/23/54)

Presents the results of an investigation at a Mach number of 4 and a Reynolds number of 5×10^6 of the time lag between flap deflection and force development on a rectangular wing having a 9-percent-thick symmetrical circular-arc profile and a 30-percent-chord full-span flap. The lag was found to be less than one-half of a millisecond or less than a 3-1/2 chord movement of the model.

NACA RM L9L16

PRESSURE MEASUREMENTS AT SUPERSONIC SPEEDS ON A SECTION OF A RECTANGULAR WING HAVING AN NACA 65-009 PROFILE. Robert W. Rainey. March 10, 1950. 31p. diagrs., photos., tab. (NACA RM L9L16) (Declassified from Confidential, 8/23/54)

Experimental and predicted pressure distributions are presented for a section of a rectangular wing having an NACA 65-009 profile at $M = 1.62$, 1.93, and 2.40 at Reynolds numbers of 1.07×10^6, 0.97×10^6, and 0.81×10^6, respectively. Integrated normal-force, pitching-moment, and chordwise coefficients, as well as shadowgraphs and a discussion of the character of flow about the model, are reported. Comparison between the aerodynamic characteristics of the NACA 65-009 airfoil and a symmetrical circular-arc airfoil of the same thickness ratio is made.

NACA RM L9L19

FLIGHT INVESTIGATION OF THE EFFECT OF THICKENING THE AILERON TRAILING EDGE ON CONTROL EFFECTIVENESS FOR SWEPTBACK TAPERED WINGS HAVING SHARP- AND ROUND-NOSE SECTIONS. H. Kurt Strass and Edison M. Fields. May 2, 1950. 20p. diagrs., photo., tab. (NACA RM L9L19) (Declassified from Confidential, 8/23/54)

The effect of thickening the trailing edge of an aileron on control effectiveness and drag at transonic and supersonic speeds as determined in flight are presented for a wing having an NACA 0010-64 airfoil section, a taper ratio of 0.455, an aspect ratio of 3.6, sweepback of the quarter-chord of 38.1°, and a trailing edge angle of 17°. The results are compared with a previous investigation of a similar wing having a circular-arc section. The blunt trailing edge eliminated the control reversal obtained with the true-contour ailerons and greatly improved the control effectiveness although at some sacrifice in drag.

NACA RM L9L21a

HYDRODYNAMIC FORCE CHARACTERISTICS OF A STREAMLINE FUSELAGE MODIFIED BY EITHER BREAKER STRIPS OR ROWS OF AIR JETS SIMULATING CHINES. Bernard Weinflash, Charles L. Shuford, Jr. and Kenneth W. Christopher. February 21, 1950. 45p. diagrs., photos. (NACA RM L9L21a) (Declassified from Confidential, 8/23/54)

Force tests were made to determine the effect of trim on the resistance, hydrodynamic lift, and hydrodynamic moment of a streamline fuselage modified by either strips or rows of air jets simulating chines. Tests were also made of the model modified by the strips for three load-on-the-water conditions and for the model with the longitudinal curvature of the after half of the fuselage bottom eliminated.

NACA RM L9L23

PRESSURE DISTRIBUTIONS ON THE BLADE SECTIONS OF THE NACA 10-(3)(049)-033 PROPELLER UNDER OPERATING CONDITIONS. W. H. Gray and Robert M. Hunt. February 14, 1950. 120p. diagrs., 11 tabs. (NACA RM L9L23) (Declassified from Confidential, 8/23/54)

Presents unanalyzed data in tabular form obtained from pressure-distribution measurements on one of a family of five related propellers incorporating 16-series blade sections. Nine radial stations were investigated with a variation of thickness ratio from 2.6 percent to 8.9 percent and covering a section Mach number range from 0.375 to 1.197.

NACA RM L9L23a

AN INVESTIGATION OF SEVERAL NACA 1-SERIES NOSE INLETS WITH AND WITHOUT PROTRUDING CENTRAL BODIES AT HIGH-SUBSONIC MACH NUMBERS AND AT A MACH NUMBER OF 1.2. Robert E. Pendley and Harold L. Robinson. February 21, 1950. 53p. diagrs., photos. (NACA RM L9L23a) (Declassified from Confidential, 8/23/54)

Measurements of pressure distribution, drag, and internal-flow pressure loss are presented for three NACA 1-series nose inlets, two of which were fitted with protruded central bodies. Test Mach number and inlet-velocity ratio ranged from 0.4 to 1.2 and from 0 to 1.34, respectively. Nose-inlet pressure drag at a Mach number of 1.2, and central-body effects on subcritical drag, the supercritical drag rise, and inlet total-pressure loss are discussed.

NACA RM L9L28a

AERODYNAMIC INVESTIGATION AT MACH NUMBER 1.92 OF A RECTANGULAR WING AND TAIL AND BODY CONFIGURATION AND ITS COMPONENTS. Macon C. Ellis, Jr. and Carl E. Grigsby. March 1, 1950. 96p. diagrs., photos., 4 tabs. (NACA RM L9L28a) (Declassified from Confidential, 8/23/54)

An investigation at Mach number 1.92 in the Langley 9-inch supersonic tunnel of a variable body-wing-tail configuration has been made in order to determine and to isolate the aerodynamic effects on each other of the components of the configuration. The body had a fineness ratio of 12.5 with a cylindrical midsection so that the aspect-ratio-4 rectangular wing could be located at three longitudinal positions along the body. The variable-incidence-angle rectangular tail was of the same aspect ratio as the wing, but one-fourth the wing area, and could be located at three vertical positions relative to the plane of the wing. The tests included lift, drag, and pitching-moment measurements of all possible elements and combinations of this model.

NACA RM L50A03

LATERAL-CONTROL INVESTIGATION OF FLAP-TYPE CONTROLS ON A WING WITH UNSWEPT QUARTER-CHORD LINE, ASPECT RATIO 4, TAPER RATIO 0.6, AND NACA 65A006 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. Alexander D. Hammond. March 10, 1950. 20p. diagrs. (NACA RM L50A03) (Declassified from Confidential, 8/23/54)

This paper presents the results of a lateral-control investigation of a 30-percent-chord flap-type control having various spans and spanwise locations on a wing with unswept quarter-chord line, aspect ratio 4, taper ratio 0.6, and an NACA 65A006 airfoil section. Rolling moments, pitching moments, and lift of the semispan wing-fuselage were obtained through a Mach number range of 0.7 to 1.15.

NACA RM L50A03a

AN 8-FOOT AXISYMMETRICAL FIXED NOZZLE FOR SUBSONIC MACH NUMBERS UP TO 0.99 AND FOR A SUPERSONIC MACH NUMBER OF 1.2. Virgil S. Ritchie, Ray H. Wright and Marshall P. Tulin. February 23, 1950. 52p. diagrs., photos., 2 tabs. (NACA RM L50A03a) (Declassified from Confidential, 8/23/54)

The design and operating characteristics of an 8-foot-diameter circular nozzle for Mach number 1.2 and for high-subsonic Mach numbers are discussed. The nozzle was carefully designed and adjusted for boundary-layer displacement. The flow in the subsonic and supersonic test sections was satisfactorily uniform for model testing. Consideration was given to disturbances in the flow, irregularities at the wall, humidity effects, and power requirements.

NACA RM L50A12

AERODYNAMIC CHARACTERISTICS OF A WING WITH QUARTER-CHORD LINE SWEPT BACK 60°, ASPECT RATIO 2, TAPER RATIO 0.6, AND NACA 65A006 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. Boyd C. Myers, II and Thomas J. King, Jr. February 24, 1950. 31p. diagrs., photos., tab. (NACA RM L50A12) (Declassified from Confidential, 8/23/54)

This paper presents the results of an investigation by the transonic-bump method of a wing-fuselage combination employing a wing with quarter-chord line swept back 60°, aspect ratio 2, taper ratio 0.6, and NACA 65A006 airfoil. Lift, drag, pitching-moment and root-bending-moment characteristics were obtained for the wing-alone and wing-fuselage configurations over a Mach number range from 0.70 to 1.18. In addition, effective downwash angles and dynamic-pressure characteristics in the region of the tail plane were obtained and are presented for a range of tail heights at one tail length. In order to expedite publishing of these data, only a brief analysis has been made.

NACA RM L50A13

PRELIMINARY INVESTIGATION OF A SUBMERGED AIR SCOOP UTILIZING BOUNDARY-LAYER SUCTION TO OBTAIN INCREASED PRESSURE RECOVERY. Mark R. Nicholas and P. Kenneth Pierpont. March 17, 1950. 77p. diagrs., photos., tab. (NACA RM L50A13) (Declassified from Confidential, 8/23/54)

Presents results of low-speed tests of a submerged inlet consisting essentially of a conventional scoop located in a dimple in the fuselage surface. Boundary-layer-control systems investigated are shown to provide important increases in performance. It appears that the flow instability frequently encountered in the case of twin internally coupled inlets will be avoided for design high-speed inlet-velocity ratios as low as 0.5.

NACA RM L50A17

LATERAL-CONTROL INVESTIGATION OF FLAP-TYPE CONTROLS ON A WING WITH QUARTER-CHORD LINE SWEPT BACK 60°, ASPECT RATIO 4, TAPER RATIO 0.6, AND NACA 65A006 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. Raymond D. Vogler. March 2, 1950. 21p. diagrs. (NACA RM L50A17) (Declassified from Confidential, 8/23/54)

This paper presents the results of a lateral-control investigation of a 30-percent-chord flap-type control of various spanwise magnitudes and locations on a wing of 60° of sweepback of the quarter-chord line, an aspect ratio of 4, a taper ratio of 0.6, and an NACA 65A006 airfoil section. Rolling and pitching moments and lift of the semispan wing-fuselage were obtained through a Mach number range of 0.7 to 1.15.

NACA RM L50A18

AERODYNAMIC CHARACTERISTICS OF A WING WITH UNSWEPT QUARTER-CHORD LINE, ASPECT RATIO 2, TAPER RATIO 0.78, AND NACA 65A004 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. Edward C. Polhamus and George S. Campbell. March 8, 1950. 17p. diagrs., photos., tab. (NACA RM L50A18) (Declassified from Confidential, 8/23/54)

This paper presents the results of an investigation by the transonic-bump method of a wing having an unswept quarter-chord line, aspect ratio 2, taper ratio 0.78, and NACA 65A004 airfoil. Lift, drag, pitching-moment, and root-bending-moment characteristics were obtained over a Mach number range of from 0.60 to 1.17. Experimental values of lift-curve slope, lateral center of pressure, and drag due to lift are compared with available theory.

NACA RM L50A23

A DISCUSSION OF THE DESIGN OF HIGHLY SWEPT PROPELLER BLADES. Richard T. Whitcomb. May 4, 1950. 31p. diagrs., photos. (NACA RM L50A23) (Declassified from Confidential, 8/23/54)

A description of the two swept propellers investigated in the Langley 8-foot high-speed tunnel is presented, together with the discussions of the numerous assumptions and analyses on which the designs of these propellers are based.

NACA RM L50A26

PRESSURE DISTRIBUTIONS ON THE BLADE SECTIONS OF THE NACA 10-(3)(090)-03 PROPELLER UNDER OPERATING CONDITIONS. Peter J. Johnson. March 22, 1950. 90p. diagrs., 10 tabs. (NACA RM L50A26) (Declassified from Confidential, 8/23/54)

Presents unanalyzed data in tabular form obtained from pressure-distribution measurements on one of a family of five related propellers incorporating NACA 16-series blade sections. Pressure distributions were measured at nine radial stations for which blade-section thickness ratio varied from 0.300 to 0.053 and section Mach number varied from 0.28 to 1.18.

NACA RM L50A30

EXPLORATORY INVESTIGATION OF LEADING-EDGE CHORD-EXTENSIONS TO IMPROVE THE LONGITUDINAL STABILITY CHARACTERISTICS OF TWO 52° SWEPTBACK WINGS. G. Chester Furlong. March 10, 1950. 32p. diagrs., photo. (NACA RM L50A30) (Declassified from Confidential, 8/23/54)

Results are presented of exploratory tests obtained with leading-edge wing chord-extensions on two 52° sweptback wings for the purpose of obtaining satisfactory longitudinal stability through the lift range. Both wings exhibit a vortex flow similar to that which has been observed on triangular wings. One wing of aspect ratio 2.8 has circular-arc airfoil sections, and the other wing of aspect ratio 2.9 has NACA 64_1-112 airfoil sections. The tests were conducted at Reynolds numbers in the vicinity of 6.0×10^6.

NACA RM L50A31

WING-FLOW MEASUREMENTS OF LONGITUDINAL STABILITY AND CONTROL CHARACTERISTICS OF A CANARD AIRPLANE CONFIGURATION WITH A 45° SWEPTBACK WING AND A TRIANGULAR ALL-MOVABLE CONTROL SURFACE. Harold L. Crane and James J. Adams. August 25, 1950. 53p. diagrs., photo. (NACA RM L50A31) (Declassified from Confidential, 8/23/54)

Presented are lift, pitching-moment, rolling-moment, and drag measurements for a semispan canard configuration for a Mach number range of 0.55 to 1.14 at Reynolds numbers between 225,000 to 575,000. The configuration consisted of a 45° sweptback untapered wing and a triangular control surface mounted on a body of fineness ratio 13.5. The aerodynamic center shift with increasing Mach number was small and the effectiveness of the control surface increased gradually with Mach number with the result that the longitudinal trim and control characteristics in the transonic speed range at low lift coefficients were desirable. Also included are calculated trim curves for various loading conditions and calculated aeroelastic effects.

NACA RM L50B02a

INVESTIGATION OF A SIMPLE DEVICE FOR PREVENTING SEPARATION DUE TO SHOCK AND BOUNDARY-LAYER INTERACTION. Coleman duP. Donaldson. November 29, 1950. 34p. diagrs., photos. (NACA RM L50B02a) (Declassified from Confidential, 8/23/54)

Results are presented of a preliminary investigation of vortex generators introduced into the region of boundary layer to increase the turbulent mixing, in an attempt to prevent separation due to boundary-layer and shock interaction. Prevention of such separation and some of its adverse effects up to Mach numbers ahead of the shock of the order of 1.4 appears possible by means of this simple device. Preliminary flight tests show that this method is effective in controlling shock-induced separation on the wing of an airplane at high speed.

NACA RM L50B03a

AERODYNAMIC CHARACTERISTICS OF A WING WITH QUARTER-CHORD LINE SWEPT BACK 45°, ASPECT RATIO 6, TAPER RATIO 0.6, AND NACA 65A009 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. Kenneth P. Spreemann, William D. Morrison, Jr. and Thomas B. Pasteur, Jr. April 6, 1950. 33p. diagrs., photos., tab. (NACA RM L50B03a) (Declassified from Confidential, 8/23/54)

This paper presents the results of an investigation by the transonic-bump method of a wing alone and a wing-fuselage combination employing a wing with quarter-chord line swept back 45°, aspect ratio 6, taper ratio 0.6, and NACA 65A009 airfoil section. Lift, drag, pitching moment, and root bending moment were obtained for the wing-alone and wing-fuselage configurations over a Mach range of 0.60 to 1.18 and through an angle-of-attack range of -4° to 10°. Effective downwash angles and dynamic-pressure characteristics in the region of the tail plane were also obtained and are presented for a range of tail heights at one tail length.

NACA RM L50B10

THE DAMPING IN ROLL OF ROCKET-POWERED TEST VEHICLES HAVING RECTANGULAR WINGS WITH NACA 65-006 AND SYMMETRICAL DOUBLE-WEDGE AIRFOIL SECTIONS OF ASPECT RATIO 4.5. Albert E. Dietz and James L. Edmondson. March 29, 1950. 12p. diagrs. (NACA RM L50B10) (Declassified from Confidential, 8/23/54)

Experimental determination of damping in roll through a Mach range of 0.85 to 1.45 was conducted for two free-flight models having rectangular wing plan forms and an aspect ratio of 4.5. One model had wings with NACA 65-006 airfoil sections and the other model had wings with 6-percent-thick modified double-wedge airfoil sections.

NACA RM L50B21

PRESSURE DISTRIBUTIONS ON THE BLADE SECTIONS OF THE NACA 10-(5)(066)-03 PROPELLER UNDER OPERATING CONDITIONS. Albert J. Evans and Wallace Luchuk. April 18, 1950. 99p. diagrs., 10 tabs. (NACA RM L50B21) (Declassified from Confidential. 8/23/54)

Presents unanalyzed data in tabular form from pressure distribution measurements on one of a family of five related propellers incorporating NACA 16-series sections. Nine radial stations were investigated which had design lift coefficients of 0.50 and varied in thickness from 16 percent to 4 percent of the chord. The Mach number varied from 0.4 to 1.15.

NACA RM L50C03

PRESSURE DISTRIBUTIONS ON THE BLADE SECTIONS OF THE NACA 10-(0)(066)-03 PROPELLER UNDER OPERATING CONDITIONS. Seymour Steinberg and Robert W. Milling. May 18, 1950. 89p. diagrs., 11 tabs. (NACA RM L50C03) (Declassified from Confidential, 8/23/54)

Presents unanalyzed data in tabular form obtained from pressure-distribution measurements on one of five related propellers incorporating NACA 16-series blade sections. Pressure distributions were measured at nine radial stations for which blade-section thickness ratio varied from 0.04 to 0.16 and section Mach number varied from 0.35 to 1.14.

NACA RM L50C16

AERODYNAMIC CHARACTERISTICS OF A WING WITH UNSWEPT QUARTER-CHORD LINE, ASPECT RATIO 4, TAPER RATIO 0.6, AND NACA 65A004 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. Boyd C. Myers, II and James W. Wiggins. May 8, 1950. 31p. diagrs., photos., tab. (NACA RM L50C16) (Declassified from Confidential, 8/23/54)

This paper presents the results of an investigation by the transonic-bump method of a wing and wing-fuselage combination employing a wing with unswept quarter-chord line, aspect ratio 4, taper ratio 0.6, and NACA 65A004 airfoil section parallel to free stream. Lift, drag, pitching-moment, and root-bending-moment characteristics were obtained for the two configurations over a Mach number range from about 0.60 to 1.15. In addition, effective downwash angles and dynamic-pressure characteristics in the region of the tail plane were obtained and presented for a range of tail heights at one tail length.

NACA RM L50C21

AERODYNAMIC CHARACTERISTICS WITH FIXED AND FREE TRANSITION OF A MODIFIED DELTA WING IN COMBINATION WITH A FUSELAGE AT HIGH SUBSONIC SPEEDS. Edward C. Polhamus and Thomas J. King, Jr. May 2, 1950. 19p. diagrs., photos. (NACA RM L50C21) (Declassified from Confidential, 8/23/54)

An investigation has been made in the Langley high-speed 7- by 10-foot tunnel to determine the aerodynamic characteristics at high subsonic speeds of a modified delta wing with an aspect ratio of 3, a taper ratio of 0.313, a sweepback of 27.7°, and an NACA 64_1A012 airfoil section in combination with a fuselage. Lift, drag, and pitching-moment characteristics with free- and fixed-transition are presented through a Mach number range of 0.40 to 0.90.

NACA RM L50C22

AERODYNAMIC AND LATERAL-CONTROL CHARACTERISTICS OF A 1/28-SCALE MODEL OF THE BELL X-1 AIRPLANE WING-FUSELAGE COMBINATION. TRANSONIC-BUMP METHOD. Vernard E. Lockwood. May 5, 1950. 28p. diagrs., tab. (NACA RM L50C22) (Declassified from Confidential, 8/23/54)

This paper presents the lateral-control characteristics and the pitching-moment characteristics of a 1/28-scale model of the X-1 wing-fuselage configuration. The tests were made in the transonic speed range from a Mach number of 0.60 to 1.15 in the Langley high-speed 7- by 10-foot tunnel utilizing the transonic bump. Comparisons have been made between the wind-tunnel results and the flight-test results of the rolling effectiveness, pitching-moment

characteristics, and lateral centers of pressure. The estimations of rolling effectiveness were made using the damping in roll and aileron effectiveness experimentally determined.

NACA RM L50C28

MAXIMUM-LIFT INVESTIGATION OF A 1/40-SCALE X-1 AIRPLANE WING AT MACH NUMBERS FROM 0.60 TO 1.15. Thomas R. Turner. April 21, 1950. 18p. diagrs. (NACA RM L50C28) (Declassified from Confidential, 8/23/54)

This paper contains the lift, drag, and pitching-moment characteristics up to a maximum lift of a 1/40-scale model of the X-1 airplane wing (8-percent-thick wing), also some comparisons with flight results. The Mach number varied from 0.60 to 1.15 with the Reynolds number varying from 415,000 to 533,000.

NACA RM L50D05

AERODYNAMIC CHARACTERISTICS AT A MACH NUMBER OF 1.25 OF A 6-PERCENT-THICK TRIANGULAR WING AND 6- AND 9-PERCENT-THICK TRIANGULAR WINGS IN COMBINATION WITH A FUSELAGE. WING ASPECT RATIO 2.31, BICONVEX AIRFOIL SECTIONS. Albert W. Hall and Garland J. Morris. May 5, 1950. 22p. diagrs., photo., 2 tabs. (NACA RM L50D05) (Declassified from Confidential, 8/23/54)

Tests were made by the NACA wing-flow method on two wing-fuselage models with delta wings of aspect ratio 2.31, 6- and 9-percent-thick biconvex sections, and on the 6-percent-thick wing alone. Lift, drag, pitching-moment, and angle-of-attack measurements are presented for these configurations and some comparisons are made with subsonic and supersonic data from other sources. The test Mach number was 1.25 and the Reynolds number was about 8.8×10^5.

NACA RM L50D19

LOW-SPEED INVESTIGATION OF DEFLECTABLE WING-TIP ELEVATORS ON A LOW-ASPECT-RATIO UNTAPERED 45° SWEPTBACK SEMISPAN WING WITH AND WITHOUT AN END PLATE. Jack Fischel and William M. O'Hare. June 1, 1950. 21p. diagrs., photo. (NACA RM L50D19) (Declassified from Confidential, 8/23/54)

Results and discussion are presented of a low-speed investigation of triangular- and parallelogrammic-plan-form deflectable wing-tip elevators on an untapered 45° sweptback semispan wing with and without a rectangular end plate (simulating a vertical fin) mounted on the wing inboard of the elevators. Lift, drag, and pitching-moment data were obtained through a large angle-of-attack range and a large elevator-deflection range for each elevator plan form on the plain wing and the wing with end plate. Estimated pitching-moment data were compared with experimental data for the two elevator plan forms.

NACA RM L50D20

FLIGHT INVESTIGATION OF THE AILERON CHARACTERISTICS OF THE DOUGLAS D-558-I AIRPLANE (BUAERO NO. 37972) AT MACH NUMBERS BETWEEN 0.6 AND 0.89. Jim Rogers Thompson, William S. Roden and John M. Eggleston. May 26, 1950. 23p. diagrs., photos., tab. (NACA RM L50D20) (Declassified from Confidential, 8/23/54)

Measurements of the aileron effectiveness of the Douglas D-558-I airplane (BuAero No. 37972) indicate that there is no change in aileron effectiveness with Mach number between Mach numbers of 0.6 and 0.89.

NACA RM L50D21

INVESTIGATION OF THE NACA 3-(3)(05)-05 EIGHT-BLADE DUAL-ROTATING PROPELLER AT FORWARD MACH NUMBERS TO 0.925. Robert J. Platt, Jr. and Robert A. Shumaker. June 19, 1950. 42p. diagrs., photo. (NACA RM L50D21) (Declassified from Confidential, 8/23/54)

Force-test results are presented for the NACA 3-(3)(05)-05 eight-blade dual propeller, which was designed for a blade angle of approximately 75°. The tests covered a blade-angle range from 55° to 80° at Mach numbers to 0.925. Some data on the effect of small changes in the rear-propeller blade angle are included. Good efficiencies were obtained at high subsonic Mach numbers by operation at high blade angles.

NACA RM L50D24

A TECHNIQUE UTILIZING ROCKET-PROPELLED TEST VEHICLES FOR THE MEASUREMENT OF THE DAMPING IN ROLL OF STING-MOUNTED MODELS AND SOME INITIAL RESULTS FOR DELTA AND UNSWEPT TAPERED WINGS. William M. Bland, Jr. and Carl A. Sandahl. June 13, 1950. 31p. diagrs., photos., tab. (NACA RM L50D24) (Declassified from Confidential, 8/23/54)

A technique with which the damping in roll of sting-mounted models can be measured over the subsonic, transonic, and supersonic speed range with rocket-propelled test vehicles is described. Initial results for delta and unswept tapered wings are presented and compared with theory.

NACA RM L50D28

EFFECT OF COMPRESSIBILITY AND CAMBER AS DETERMINED FROM AN INVESTIGATION OF THE NACA 4-(3)(08)-03 AND 4-(5)(08)-03 TWO-BLADE PROPELLERS UP TO FORWARD MACH NUMBERS OF 0.925. Melvin M. Carmel, Francis G. Morgan, Jr. and Domenic A. Coppolino. June 29, 1950. 92p. diagrs., photo. (NACA RM L50D28) (Declassified from Confidential, 8/23/54)

Section-thrust-coefficient data are presented for forward Mach numbers up to 0.925 for the NACA 4-(3)(08)-03 propeller for blade angles of 55° to 65° and for the NACA 4-(5)(08)-03 propeller for blade angles of 40° to 65°. A comparison of these results with force-test results is made.

NACA RM L50E09

LATERAL-CONTROL INVESTIGATION OF FLAP-TYPE AND SPOILER-TYPE CONTROLS ON A WING WITH QUARTER-CHORD-LINE SWEEPBACK OF 60°, ASPECT RATIO 2, TAPER RATIO 0.6, AND NACA 65A006 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. Alexander D. Hammond. July 18, 1950. 26p. diagrs. (NACA RM L50E09) (Declassified from Confidential, 8/23/54)

This paper presents the results of a lateral-control investigation of a 30-percent-chord flap-type control and a plain spoiler-type control of 5-percent-chord projection, each having various span and spanwise locations on a wing with a quarter-chord line swept back 60°, aspect ratio 2, taper ratio 0.6, and an NACA 65A006 airfoil section parallel to free stream. Rolling and pitching moments and lift of the semispan wing-fuselage were obtained through a Mach number range of 0.17 to 1.15 with flap-type controls, and lift, drag, pitching moment, rolling moment, and yawing moment of the semispan wing-fuselage were obtained through a Mach number range of 0.6 to 1.15 with the spoiler-type controls.

NACA RM L50E19a

FLIGHT INVESTIGATION AT MACH NUMBERS FROM 0.6 to 1.7 TO DETERMINE DRAG AND BASE PRESSURES ON A BLUNT-TRAILING-EDGE AIRFOIL AND DRAG OF DIAMOND AND CIRCULAR-ARC AIRFOILS AT ZERO LIFT. John D. Morrow and Ellis Katz. August 11, 1950. 25p. diagrs., photos. (NACA RM L50E19a) (Declassified from Confidential, 8/23/54)

Results of an exploratory free-flight investigation at zero lift of several rocket-powered drag-research models having rectangular 6-percent-thick wings are presented for a Mach number range of 0.6 to 1.7. Wings having diamond, circular-arc, and blunt-trailing-edge airfoil sections were tested. Pressures over the base of the blunt-trailing-edge airfoil were measured. The drags of all the models were measured and are compared with theory in this paper.

NACA RM L50E26

DAMPING IN ROLL OF RECTANGULAR WINGS OF SEVERAL ASPECT RATIOS AND NACA 65A-SERIES AIRFOIL SECTIONS OF SEVERAL THICKNESS RATIOS AT TRANSONIC AND SUPERSONIC SPEEDS AS DETERMINED WITH ROCKET-POWERED MODELS. James L. Edmondson. August 24, 1950. 16p. diagrs. (NACA RM L50E26) (Declassified from Confidential, 8/23/54)

The damping in roll has been determined for a series of rectangular wings of various aspect ratios and thickness ratios through use of rocket-powered models and the canted-nozzle technique. An empirical thickness correction factor has been derived to be used with existing linear supersonic damping-in-roll theory to allow closer prediction of experimental damping for limited cases.

NACA RM L50F01

RESULTS OF FLIGHT TESTS TO DETERMINE THE ZERO-LIFT DRAG CHARACTERISTICS OF A 60° DELTA WING WITH NACA 65-006 AIRFOIL SECTION AND VARIOUS DOUBLE-WEDGE SECTIONS AT MACH NUMBERS FROM 0.7 TO 1.6. Clement J. Welsh. August 11, 1950. 15p. diagrs., photo. (NACA RM L50F01) (Declassified from Confidential, 8/23/54)

Results of an exploratory free-flight investigation at zero lift of several rocket-powered drag research models equipped with 60° sweptback delta wings are presented for a Mach number range from about 0.70 to 1.60. The airfoil sections tested included the NACA 65-006 and a series of double-wedge sections with various positions of maximum thickness.

NACA RM L50F19

LOW-SPEED TESTS OF A MODEL SIMULATING THE PHENOMENON OF CONTROL-SURFACE BUZZ. William H. Phillips and James J. Adams. August 16, 1950. 16p. diagrs., photo. (NACA RM L50F19) (Declassified from Confidential, 8/23/54)

Low-speed tests have been made of an airfoil model with a freely hinged flap connected to spoilers which passed through slots in the airfoil ahead of the hinge line. Under certain conditions, continuous oscillations of the flap, similar to buzz, were obtained. This result indicates that flow separation may be an important factor in producing buzz at transonic speeds.

NACA RM L50F19a

SPIN AND RECOVERY CHARACTERISTICS OF A MODEL OF A FIGHTER TYPE OF AIRPLANE WITHOUT A HORIZONTAL TAIL AND HAVING EITHER A SINGLE VERTICAL TAIL OR TWIN VERTICAL TAILS. Lawrence J. Gale and Norman E. Pumphrey. July 25, 1950. 23p. diagrs., photos., 2 tabs. (NACA RM L50F19a) (Declassified from Confidential, 8/23/54)

The investigation indicated similar spin and recovery characteristics for either tail configuration tested at a given mass distribution. For a mass distribution chiefly along the wings, the vertical tail surfaces were not adequate for recovery from the spin. When the mass was distributed chiefly along the fuselage, however, either vertical-tail configuration, when in a rearward position, was effective in satisfactorily terminating the spin.

NACA RM L50F26
National Advisory Committee for Aeronautics.
MEASUREMENTS OF THE EFFECT OF TRAILING-EDGE THICKNESS ON THE ZERO-LIFT DRAG OF THIN LOW-ASPECT-RATIO WINGS. John D. Morrow. August 14, 1950. 12p. diagrs., photo. (NACA RM L50F26) (Declassified from Confidential, 8/23/54)

Results of an exploratory free-flight investigation at zero lift of several rocket-powered drag-research models having 4-percent-thick wings of 0.423 taper ratio are presented for a Mach number range of 0.7 to 1.6. Four wings having trailing edges of different thickness were tested. The drag of all the models was measured and is compared with calculated values in this paper.

NACA RM L50F26a

SOME CALCULATIONS OF THE LATERAL RESPONSE OF TWO AIRPLANES TO ATMOSPHERIC TURBULENCE WITH RELATION TO THE LATERAL SNAKING PROBLEM. John D. Bird. August 25, 1950. 24p. diagrs., 2 tabs. (NACA RM L50F26a) (Declassified from Confidential, 8/23/54)

Calculations are made of the lateral response to representative time histories of atmospheric turbulence for two airplanes having widely different dynamic properties; explanations for their difference in behavior are given. The results are discussed in relation to lateral snaking.

NACA RM L50F30

A THEORETICAL INVESTIGATION OF THE INFLUENCE OF AUXILIARY DAMPING IN PITCH ON THE DYNAMIC CHARACTERISTICS OF A PROPORTIONALLY CONTROLLED SUPERSONIC CANARD MISSILE CONFIGURATION. Walter C. Nelson and Anthony L. Passera. August 25, 1950. 46p. diagrs., photo., 3 tabs. (NACA RM L50F30) (Declassified from Confidential, 8/23/54)

A theoretical investigation is presented of the dynamic characteristics of a supersonic canard missile configuration with auxiliary damping in pitch obtained from rate gyro-servo control. Variations in Mach number, altitude, and static margin are considered. Satisfactory system performance is obtained throughout a Mach number and altitude range when additional damping is included in the missile.

NACA RM L50F30a

FLIGHT TESTS AT SUPERSONIC SPEEDS TO DETERMINE THE EFFECT OF TAPER ON THE ZERO-LIFT DRAG OF SWEPTBACK LOW-ASPECT-RATIO WINGS. Murray Pittel. September 5, 1950. 23p. diagrs., photos. (NACA RM L50F30a) (Declassified from Confidential, 8/23/54)

Comparison of experimental flight-test results with theoretical calculations to determine the effect of wing taper and aspect ratio on the zero-lift drag of wings with thin double-wedge sections at supersonic speeds is presented.

NACA RM L50G03

INVESTIGATION OF FLAP-TYPE AILERONS ON AN UNTAPERED WING HAVING AN ASPECT RATIO OF 3.7, 45° SWEEPBACK, AND AN NACA 65A009 AIRFOIL SECTION. TRANSONIC-BUMP METHOD. Richard G. MacLeod. August 23, 1950. 18p. diagrs. (NACA RM L50G03) (Declassified from Confidential, 8/23/54)

This paper presents the results of an investigation to determine the lateral control characteristics of 20-percent-chord flap-type control surfaces of various spans on a semispan wing-fuselage model by the transonic-bump method. The model employed a wing with a sweepback of 45°, an aspect ratio 3.7, a taper ratio of 1.0, and an NACA 65A009 airfoil section parallel to the free stream. Rolling moments were obtained through a small range of angle of attack and control-surface deflections. Lift data on the complete model are also included. The experimental results were in good agreement with those predicted from low-speed theory and other experimental data at a Mach number of 0.6, and the relative spanwise effectiveness of the aileron remained fairly constant throughout the Mach number range tested.

NACA RM L50G11

LOW-SPEED STATIC STABILITY CHARACTERISTICS OF A CANARD MODEL WITH A 45° SWEPTBACK WING AND A 60° TRIANGULAR HORIZONTAL CONTROL SURFACE. John W. Draper. September 6, 1950. 43p. diagrs., photo., 2 tabs. (NACA RM L50G11) (Declassified from Confidential, 8/23/54)

This paper contains results of an investigation made to determine the low-speed static stability characteristics of a canard model having a 45° sweptback untapered wing and a 60° triangular-plan-form horizontal control surface.

NACA RM L50G13a

INVESTIGATION AT TRANSONIC SPEEDS OF A 35-PERCENT-CHORD AILERON ON A TAPERED WEDGE-TYPE WING OF ASPECT RATIO 2.5 WITH AND WITHOUT A FUSELAGE. Thomas R. Turner and Joseph E. Fikes. September 8, 1950. 25p. diagrs. (NACA RM L50G13a) (Declassified from Confidential, 8/23/54)

This paper presents the results of an investigation to determine the effects of fuselage diameter on some of the aerodynamic characteristics of an unswept wing having a modified double-wedge section, an aspect ratio of 2.5, and a taper ratio of 0.625. Rolling moment coefficients for a 35-percent-chord aileron of various spans along with some lift, drag, and pitching moment coefficient data are presented for the wing with a fuselage of two different diameters and without a fuselage through a Mach number range from 0.60 to 1.18. Estimated and experimental values of aileron effectiveness are presented at a Mach number of 0.60.

NACA RM L50G14

AERODYNAMIC CHARACTERISTICS AT A MACH NUMBER OF 1.38 OF FOUR WINGS OF ASPECT RATIO 4 HAVING QUARTER-CHORD SWEEP ANGLES OF 0°, 35°, 45°, AND 60°. William B. Kemp, Jr., Kenneth W. Goodson and Robert A. Booth. October 10, 1950. 41p. diagrs., photos., tab. (NACA RM L50G14) (Declassified from Confidential, 8/23/54)

This paper presents a description of the Langley 6-inch supersonic tunnel together with the results of an investigation made at a Mach number of 1.38 of a series of wings having an aspect ratio 4, taper ratio 0.6, and an NACA 65A006 airfoil section. Lift, drag, pitching-moment, and bending-moment data were obtained for wing alone and wing-body configurations. Comparisons are made between experimental and theoretical lift-curve slopes and stability characteristics.

NACA RM L50G14a

THE EXTERNAL-SHOCK DRAG OF SUPERSONIC INLETS HAVING SUBSONIC ENTRANCE FLOW. Louis M. Nucci. December 20, 1950. 28p. diagrs., photos. (NACA RM L50G14a) (Declassified from Confidential, 8/23/54)

The external-shock drag at a Mach number of 2.70 has been determined by two methods for a circular inlet having low external compression at various mass-flow conditions and for a circular inlet having high external compression. The results indicate a large increase in external shock drag for both inlets at subdesign mass flows, with the drag of the external compression type being considerably higher for comparable mass-flow reduction than that of the inlet having low external compression. A simple approximate method of calculating the external-shock drag is described which is more easily applied than the procedure using characteristics if the entering mass flow and the shock configuration are both known.

NACA RM L50G18

THE CALCULATION OF THE PATH OF A JETTISONABLE NOSE SECTION. Roscoe H. Goodwin. September 7, 1950. 35p. diagrs. (NACA RM L50G18) (Declassified from Confidential, 8/23/54)

A method is presented for calculating the path of a jettisonable nose section at any speed by means of successive approximations (solved graphically) using static aerodynamic characteristics. Comparisons with experimentally determined paths are presented, and the method is applied to the problem of finding the path of a nose section that is jettisoned by use of rockets.

NACA RM L50G24

FLIGHT MEASUREMENTS OF DRAG AND BASE PRESSURE OF A FIN-STABILIZED PARABOLIC BODY OF REVOLUTION (NACA RM-10) AT DIFFERENT REYNOLDS NUMBERS AND AT MACH NUMBERS FROM 0.9 TO 3.3. H. Herbert Jackson, Charles B. Rumsey and Leo T. Chauvin. September 1, 1950. 21p. diagrs., photos. (NACA RM L50G24) (Declassified from Confidential, 8/23/54)

Free-flight tests at supersonic speeds have been made to determine the Reynolds number effects on total drag and base drag of a fin-stabilized parabolic-arc body of revolution having a body fineness ratio of 12.2 and designated the NACA RM-10 configuration. The Reynolds number range of 14×10^{6} to 210×10^{6} was obtained by testing full-scale and half-scale models through the Mach number range from 0.9 to 3.3.

NACA RM L50H03

PROPELLER SECTION AERODYNAMIC CHARACTERISTICS AS DETERMINED BY MEASURING THE SECTION SURFACE PRESSURES ON AN NACA 10-(3)(08)-03 PROPELLER UNDER OPERATING CONDITIONS. Albert J. Evans. November 8, 1950. 162p. diagrs., 10 tabs. (NACA RM L50H03) (Declassified from Confidential, 8/23/54)

This investigation presents propeller section aerodynamic characteristics obtained by measurement of the section surface pressure distribution at nine radial stations on an operating propeller blade. The results are compared with results from tests with two-dimensional airfoils and cover a range of Mach numbers from 0.20 to 1.15 for angles of attack from -1° to 12° for NACA 16-series airfoils.

NACA RM L50H07

LONGITUDINAL STABILITY AND CONTROL CHARACTERISTICS AT HIGH-SUBSONIC SPEEDS OF TWO MODELS OF A TRANSONIC RESEARCH AIRPLANE WITH WINGS AND HORIZONTAL TAILS OF ASPECT RATIOS 4.2 AND 2. Arvo A. Luoma and John B. Wright. September 29, 1950. 134p. diagrs., photos., 3 tabs. (NACA RM L50H07) (Declassified from Confidential, 8/23/54)

This paper contains longitudinal stability and control characteristics of two 1/16-scale models of a transonic research airplane tested with no nose-inlet flow. Aspect ratio was the main variable. Various horizontal-tail incidences and elevator deflections were tested. The tests were made up to a Mach number of approximately 0.95 in the Langley 8-foot high-speed tunnel.

NACA RM L50H09

MEASUREMENTS OF AERODYNAMIC CHARACTERISTICS OF A 35° SWEPTBACK NACA 65-009 AIRFOIL MODEL WITH 1/4-CHORD FLAP HAVING A 31-PERCENT-FLAP-CHORD OVERHANG BALANCE BY THE NACA WING-FLOW METHOD. Harold I. Johnson and Harold R. Goodman. September 25, 1950. 38p. diagrs., photo. (NACA RM L50H09) (Declassified from Confidential, 8/23/54)

Lift, pitching-moment, and hinge-moment data obtained from wing-flow tests of a low-aspect-ratio sweptback-airfoil model having a full-span 1/4-chord overhang-balanced flap are presented. Mach number range was 0.55 to 1.15. Comparisons are made with previously unpublished data from tests of a plain-flap model. Conclusion is that 31-percent-flap-chord overhang balance tested was relatively ineffective for reducing hinge moments below a Mach number of 1.00 and totally ineffective between Mach numbers of 1.00 and 1.15.

NACA RM L50H11

EFFECTS OF SWEEP ON THE MAXIMUM-LIFT CHARACTERISTICS OF FOUR ASPECT-RATIO-4 WINGS AT TRANSONIC SPEEDS. Thomas R. Turner. October 3, 1950. 25p. diagrs. (NACA RM L50H11) (Declassified from Confidential, 8/23/54)

An investigation at transonic speeds has been made to determine the effect of wing sweep on the maximum lift characteristics of a series of wings having an aspect ratio of 4, a taper ratio of 0.6, and the quarter-chord line swept back 0°, 35°, 45°, and 60°. The Mach number varied from 0.61 to 1.20 with a Reynolds number variation from 380,000 to 460,000. Lift data are presented from approximately zero lift to beyond maximum lift. Drag and pitching-moment data are also presented.

NACA RM L50H15

LOW-SPEED INVESTIGATION OF A SEMISUBMERGED AIR SCOOP WITH AND WITHOUT BOUNDARY-LAYER SUCTION. P. Kenneth Pierpont and Robert R. Howell. February 23, 1951. 46p. diagrs., photos., 2 tabs. (NACA RM L50H15) (Declassified from Confidential, 8/23/54)

This investigation presents results at low-speed tests of a half-submerged inlet consisting of a conventional scoop located in a depression in the fuselage surface. Boundary-layer-control systems investigated are shown to provide increases in impact-pressure ratio up to 8 percent at $V_i/V_o = 0.6$. The impact-pressure recovery of a partly submerged inlet appears to exceed that of a submerged inlet in the inlet-velocity-ratio range suitable for high-speed operation.

NACA RM L50H22

TRANSONIC DRAG CHARACTERISTICS OF A WING-BODY COMBINATION USING A THIN TAPERED WING OF 45° SWEEPBACK. Max C. Kurbjun and Stanley Faber. September 28, 1950. 14p. diagrs., photo., tab. (NACA RM L50H22) (Declassified from Confidential, 8/23/54)

Contains drag measurements by the free-fall method for a wing-body combination and its components employing a wing of 0.2 taper ratio, NACA 65003 airfoil section (perpendicular to midchord line), 45° sweepback (midchord line), and a fineness-ratio-12 body.

NACA RM L50H23

PRELIMINARY EMPIRICAL DESIGN REQUIREMENTS FOR THE PREVENTION OF TUMBLING OF AIRPLANES HAVING NO HORIZONTAL TAILS. Robert L. Bryant. October 11, 1950. 23p. diagrs., 2 tabs. (NACA RM L50H23) (Declassified from Confidential, 8/23/54)

An investigation has been made of the design characteristics and loadings that are conducive to the tumbling of airplanes that have no horizontal tails. Preliminary empirical design requirements based on model tests of 18 different configurations are presented. A brief explanation of the phenomenon of tumbling is appended.

NACA RM L50H24

AN INVESTIGATION OF THREE TRANSONIC FUSELAGE AIR INLETS AT MACH NUMBERS FROM 0.4 TO 0.94 AND AT A MACH NUMBER OF 1.19. Robert E. Pendley, Harold L. Robinson and Claude V. Williams. November 7, 1950. 51p. diagrs., photos., 3 tabs. (NACA RM L50H24) (Declassified from Confidential, 8/23/54)

Measurements of internal-flow pressure recovery, external-surface pressures, and external drag are presented for three fuselage-side inlets designed for use at transonic speeds. The test Mach number and inlet-velocity ratio ranged from 0.4 to 1.19 and from 0 to 1.9, respectively. The investigation showed that the maximum value of the impact-pressure recovery was high at all Mach numbers. The use of a higher critical Mach number external shape increased the supercritical drag-rise Mach number, decreased the supercritical drag, and reduced the drag at the supersonic Mach number.

NACA RM L50H28a

EFFECT OF AN END PLATE ON THE AERODYNAMIC CHARACTERISTICS OF A 20.55° SWEPTBACK WING WITH AN ASPECT RATIO OF 2.67 AND A TAPER RATIO OF 0.5. TRANSONIC-BUMP METHOD. James M. Watson. December 21, 1950. 15p. diagrs., photo. (NACA RM L50H28a) (Declassified from Confidential, 8/23/54)

This paper contains the results of an investigation of two wings having an aspect ratio of 2.67, a sweepback of 20.55°, and a taper ratio of 0.5, one wing with and one wing without an end plate. A Mach number range of 0.60 to 1.18 was attained by use of the transonic-bump technique.

NACA RM L50H30a

DAMPING IN YAW AND STATIC DIRECTIONAL STABILITY OF A CANARD AIRPLANE MODEL AND OF SEVERAL MODELS HAVING FUSELAGES OF RELATIVELY FLAT CROSS SECTION. Joseph L. Johnson. October 16, 1950. 20p. diagrs., tab. (NACA RM L50H30a) (Declassified from Confidential, 8/23/54)

Contains results of damping-in-yaw and static-directional-stability tests for flat-fuselage models having major axis horizontal and vertical, for a flat-fuselage model with major axis horizontal in combination with a 45° sweptback wing, and for a canard model having a triangular horizontal control surface and a 45° sweptback wing. The effect of a vertical tail located at the rear of the fuselage was determined for each model investigated.

NACA RM L50I01

LOW-SPEED WIND-TUNNEL INVESTIGATION OF A TRIANGULAR SWEPTBACK AIR INLET IN THE ROOT OF A 45° SWEPTBACK WING. Arvid L. Keith, Jr. and Jack Schiff. November 6, 1950. 71p. diagrs., photos., 5 tabs. (NACA RM L50I01) (Declassified from Confidential, 8/23/54)

Results of a low-speed study of a 45° sweptback wing-root air-inlet configuration believed suitable for transonic speed airplanes are presented. The inlet configuration lift and drag characteristics are compared with those of a basic model. Boundary-layer growth along the fuselage nose, inlet total-pressure recoveries, and static-pressure distributions over the inlet and wing surfaces are presented for wide ranges of inlet-velocity ratio and angle of attack.

NACA RM L50I05

EFFECTS ON THE LATERAL OSCILLATION OF FIXING THE RUDDER AND REFLEXING THE FLAPS ON THE BELL X-1 AIRPLANE. Hubert M. Drake. December 11, 1950. 14p. diagrs., photo. (NACA RM L50I05) (Declassified from Confidential, 8/23/54)

In flight tests of the Bell X-1 airplane at a Mach number of 0.85 it has been found that fixing the rudder reduced the amplitude of the snaking oscillation, but did not eliminate it. It was also found that reflexing the wing flaps to change the inclination of the principal axis of inertia increased the dynamic lateral stability, but had only a small effect on the snaking oscillation.

NACA RM L50I08a

FLIGHT INVESTIGATION AT MACH NUMBERS FROM 0.8 TO 1.5 TO DETERMINE THE EFFECTS OF NOSE BLUNTNESS ON THE TOTAL DRAG OF TWO FIN-STABILIZED BODIES OF REVOLUTION. Roger G. Hart. October 16, 1950. 12p. diagrs., photos., 2 tabs. (NACA RM L50I08a) (Declassified from Confidential, 8/23/54)

Values of total-drag coefficient were measured for two fin-stabilized, blunt-nose bodies of revolution in free flight at Mach numbers from 0.8 to 1.5. The blunt-nose bodies were designed by rounding off the sharp noses of bodies, having nose fineness ratios of about 3-1/2, to radii equal to about 1/4 the maximum radii. No increase in the drag of either body was found.

NACA RM L50I28a

FLIGHT MEASUREMENTS OF BASE PRESSURE ON BODIES OF REVOLUTION WITH AND WITHOUT SIMULATED ROCKET CHAMBERS. Robert F. Peck. November 16, 1950. 21p. diagrs., photos. (NACA RM L50I28a) (Declassified from Confidential, 8/23/54)

Base pressures were measured on fin-stabilized bodies of revolution with and without rocket chambers and with and without a converging afterbody. At Mach numbers between 0.7 and 1.2, the results show that the presence of a "cold" rocket chamber increased the pressure (less suction) over the center portion of the bases. The effects of rocket chambers on pressures near the edge of the bases were not as consistent throughout the Mach number range nor as appreciable at most speeds as were the effects on pressures measured on the center line.

NACA RM L50J02

A PRELIMINARY FLIGHT INVESTIGATION OF THE EFFECTS OF VORTEX GENERATORS ON SEPARATION DUE TO SHOCK. Lindsay J. Lina and Wilmer H. Reed, III. November 30, 1950. 30p. diagrs., photos., tab. (NACA RM L50J02) (Declassified from Confidential, 8/23/54)

A preliminary flight investigation showed that several configurations of vortex generators mounted on the upper surface of a modified wing of an F-51D airplane reduced separation caused by shock.

NACA RM L50J05

A WIND-TUNNEL INVESTIGATION OF THE AERODYNAMIC CHARACTERISTICS OF A FULL-SCALE SWEPTBACK PROPELLER AND TWO RELATED STRAIGHT PROPELLERS. Albert J. Evans and George Liner. January 4, 1951. 102p. diagrs., photos., tab. (NACA RM L50J05) (Declassified from Confidential, 8/31/54)

Propeller aerodynamic characteristics are presented and a brief description of the NACA 10-(1.7)(062) -057-27 two-blade swept propeller and two related straight propellers is included. An increase of about 6 percent in the value of helical tip Mach number at which compressibility losses become manifest was realized by the use of sweep. Analysis of the results warns against pseudo gains attained by the use of sweep in propellers at the expense of overall performance.

NACA RM L50J06

INVESTIGATION OF A 42.7° SWEPTBACK WING MODEL TO DETERMINE THE EFFECTS OF TRAILING-EDGE THICKNESS ON THE AILERON HINGE-MOMENT AND FLUTTER CHARACTERISTICS AT TRANSONIC SPEEDS. Robert F. Thompson. December 26, 1950. 42p. diagrs., photos., 2 tabs. (NACA RM L50J06) (Declassified from Confidential, 8/31/54)

A wind-tunnel investigation of a semispan wing-fuselage model having 42.7° of sweepback of the wing leading edge was made through a speed range to a Mach number of 0.60 to 1.175. The 0.20-chord outboard aileron was tested with three trailing-edge to hinge-line thickness ratios ($t = 0$, $t = 0.5$, and $t = 1.0$) to determine the effects on hinge moments and one-degree-of-freedom aileron flutter. Presented are hinge-moment data, hinge-moment parameters, and aileron free-floating characteristics. A comparison of the flutter frequency is made with two previously published empirical analyses.

NACA RM L50J10

TABULATED PRESSURE COEFFICIENTS AND AERODYNAMIC CHARACTERISTICS MEASURED IN FLIGHT ON THE WING OF THE DOUGLAS D-558-I AIRPLANE FOR A 1 g STALL, A SPEED RUN TO A MACH NUMBER OF 0.90, AND A WIND-UP TURN AT A MACH NUMBER OF 0.86. Earl R. Keener and Mary Pierce. December 15, 1950. 40p. diagrs., photos., 5 tabs. (NACA RM L50J10) (Declassified from Confidential, 8/31/54)

Presents tabulated pressure coefficients and aerodynamic characteristics measured in flight on the right wing of the Douglas D-558-I airplane for a 1 g stall, a speed run to a Mach number of 0.90, and a wind-up turn at a Mach number of 0.86.

NACA RM L50J12

DRAG INVESTIGATION OF SOME FIN CONFIGURATIONS FOR BOOSTER ROCKETS AT MACH NUMBERS BETWEEN 0.5 AND 1.4. John C. McFall, Jr. November 21, 1950. 17p. diagrs., photos., tab. (NACA RM L50J12) (Declassified from Confidential, 8/31/54)

This paper presents the results of an investigation using rocket-propelled free-flight models to furnish drag data for booster drag estimates and to determine the drag of various booster fin configurations. Model booster fins of a type extensively used by the NACA were flown through a Mach number range of 0.5 to 1.4. Two booster plan forms were investigated: one with aspect ratio 2.04, taper ratio 0.37, and having various tie-rod bracing and the other, a cantilever design, with aspect ratio 3.20 and taper ratio 0.32.

NACA RM L50J17

SKIN-TEMPERATURE TELEMETER FOR DETERMINING BOUNDARY-LAYER HEAT-TRANSFER COEFFICIENTS. Clifford L. Fricke and Francis B. Smith. March 15, 1951. 22p. diagrs. (NACA RM L50J17) (Declassified from Confidential, 8/31/54)

A method of experimentally determining boundary-layer heat-transfer coefficients by telemetering the skin temperatures of supersonic rockets is given. A platinum resistance wire temperature sensing element developed to indicate accurately the rapidly changing skin temperature is described and the overall accuracy of the instrumentation is discussed.

NACA RM L50J18

INVESTIGATION AT SUPERSONIC SPEEDS OF SOME OF THE FACTORS AFFECTING THE FLOW OVER A RECTANGULAR WING WITH SYMMETRICAL CIRCULAR-ARC SECTION AND 30-PERCENT-CHORD TRAILING-EDGE FLAP. K. R. Czarnecki and James N. Mueller. January 2, 1951. 111p. diagrs., photos. (NACA RM L50J18) (Declassified from Confidential, 8/31/54)

The results of an investigation at supersonic speeds ($M = 1.62$, 1.93, and 2.40) of some of the factors affecting the flow over a rectangular wing with a symmetrical circular-arc section and a 30-percent-chord trailing-edge flap are presented. The factors included are Mach number, wing thickness, effect of fixing transition, flap-gap leakage, model asymmetry, and surface condition.

NACA RM L50J19

EFFECTS OF SWEEP ON THE DAMPING-IN-ROLL CHARACTERISTICS OF THREE SWEPTBACK WINGS HAVING AN ASPECT RATIO OF 4 AT TRANSONIC SPEEDS. Vernard E. Lockwood. December 14, 1950. 23p. diagrs. (NACA RM L50J19) (Declassified from Confidential, 8/31/54)

The damping-in-roll characteristics of three wings of aspect ratio 4 and taper ratio 0.6 with sweep angles of 0°, 35°, and 45° at the quarter-chord line and an NACA 65A006 airfoil section have been determined through the Mach number range from 0.6 to 1.15 and an angle-of-attack range from 0° to approximately 7° in the Langley 7- by 10-foot-tunnel transonic bump by the twisted-wing method. Comparisons are included with the results obtained at subsonic Mach numbers by the free-roll method on a series of similar wings.

NACA RM L50J20

LOW-SPEED INVESTIGATION OF THE EFFECT OF SEVERAL FLAP AND SPOILER AILERONS ON THE LATERAL CHARACTERISTICS OF A 47.5° SWEPTBACK-WING - FUSELAGE COMBINATION AT A REYNOLDS NUMBER OF 4.4×10^6. Jerome Pasamanick and Thomas B. Sellers. December 8, 1950. 57p. diagrs., photo. (NACA RM L50J20) (Declassified from Confidential, 8/31/54)

Presents results of an investigation in the Langley full-scale tunnel of various plain spoiler and flap-type ailerons on a wing-fuselage combination. The wing leading-edge sweep was 47.5°, the aspect ratio was 3.4, the taper ratio was 0.51, and the airfoil sections were NACA 64_1A112. The data include the effects of aileron span, location, and trailing-edge thickness and of spoiler span, location, and projection on the longitudinal and lateral characteristics at zero yaw for a range of angle of attack at a Reynolds number of 4.4×10^6.

NACA RM L50J30

FLIGHT INVESTIGATION OF THE EFFECT OF SIDESLIP ON THE PRESSURE AT THE STATIC ORIFICES OF THE BOEING B-29 AIRPLANE. Robert G. Chilton and B. Porter Brown. April 11, 1951. 12p. diagrs. (NACA RM L50J30) (Declassified from Confidential, 8/31/54)

The effect of sideslip on the measurement of static pressure obtained from orifices located on each side of the fuselage near the nose of an airplane is shown by measurements taken in steady and oscillatory sideslips. The result is discussed with respect to its effect on the indications of change and rate of change of altitude of an airplane on a bombing run.

NACA RM L50K01a

EFFECTS ON THE SNAKING OSCILLATION OF THE BELL X-1 AIRPLANE OF A TRAILING-EDGE BULB ON THE RUDDER. Hubert M. Drake and Harry P. Clagett. January 16, 1951. 14p. diagrs., photo. (NACA RM L50K01a) (Declassified from Confidential, 8/31/54)

It was found that a rudder trailing-edge bulb did not appreciably affect the snaking oscillation over the Mach number range from 0.75 to 1.0.

NACA RM L50K09

ESTIMATED DECELERATION OF AIRPLANE NOSE SECTION JETTISONED AT VARIOUS ALTITUDES AND AIRSPEEDS. Stanley H. Scher. January 8, 1951. 39p. diagrs. (NACA RM L50K09) (Declassified from Confidential, 8/31/54)

An analytical investigation has been made of the deceleration of typical proposed airplane jettisonable nose sections after being jettisoned at Mach numbers ranging from 0.85 to 3.0 and at altitudes ranging from sea level to 120,000 feet.

NACA RM L50K10

THE EFFECT OF MASS DISTRIBUTION ON THE LOW-SPEED DYNAMIC LATERAL STABILITY AND CONTROL CHARACTERISTICS OF A MODEL WITH A 60° TRIANGULAR WING. Joseph L. Johnson. March 9, 1951. 23p. diagrs., 2 tabs. (NACA RM L50K10) (Declassified from Confidential, 8/31/54)

Results of an investigation to determine the effect of mass distribution on the dynamic lateral stability and control characteristics of a model with a 60° triangular wing are presented. The moments of inertia in roll and yaw were increased to correspond to those of a triangular-wing fighter airplane with wing tanks. Flight tests and calculations were made for five different loading conditions.

NACA RM L50K20

THE USE OF SUCTION TO PREVENT SHOCK-INDUCED SEPARATION IN A NOZZLE. James R. Sterrett, Robert W. Dunning and Maurice J. Brevoort. January 30, 1951. 64p. diagrs., photos., 2 tabs. (NACA RM L50K20) (Declassified from Confidential, 8/31/54)

An investigation was made of the use of suction to prevent shock-induced flow separation in a nozzle formed by a 7.5-percent-thick bump on the wall of a channel. Various transverse and longitudinal suction-slot arrangements and suction through porous surfaces were tested. All these devices were effective in preventing separation, and certain suction-slot arrangements reduced the total power loss, including the power lost in the suction process.

NACA RM L50K27

AN EXPERIMENTAL STUDY AT MODERATE AND HIGH SUBSONIC SPEEDS OF THE FLOW OVER WINGS WITH 30° AND 45° OF SWEEPBACK IN CONJUNCTION WITH A FUSELAGE. Richard T. Whitcomb. June 15, 1951. 56p. diagrs., photos. (NACA RM L50K27) (Declassified from Confidential, 8/31/54)

A relatively extensive study is presented of the pressure distributions, wake surveys, and tuft patterns obtained at Mach numbers to 0.96 for tapered wings with 30° and 45° of sweepback in conjunction with a fuselage.

NACA RM L50K28

AN EXPERIMENTAL STUDY OF MODERATE AND HIGH SUBSONIC SPEEDS OF THE FLOW OVER WINGS WITH 30° AND 45° OF SWEEPFORWARD IN CONJUNCTION WITH A FUSELAGE. Richard T. Whitcomb. June 15, 1951. 47p. diagrs., photo. (NACA RM L50K28) (Declassified from Confidential, 8/31/54)

A relatively extensive study is presented of the pressure distributions and wake measurements obtained at Mach numbers to 0.96 for tapered wings with 30° and 45° of sweepforward, in conjunction with a fuselage.

NACA RM L50L01

AERODYNAMIC CHARACTERISTICS AT TRANSONIC SPEEDS OF A 60° DELTA WING EQUIPPED WITH A TRIANGULAR PLAN-FORM CONTROL HAVING A SKEWED HINGE AXIS AND AN OVERHANG BALANCE. TRANSONIC-BUMP METHOD. Harleth G. Wiley. February 6, 1951. 31p. diagrs. (NACA RM L50L01) (Declassified from Confidential, 8/31/54)

This paper presents the aerodynamic characteristics of a 60° delta wing of aspect ratio 2.31, taper ratio 0, and an NACA 65-006 airfoil section, which was equipped with an aerodynamically balanced triangular control mounted on a skewed hinge axis. Lift, drag, pitching moment, rolling moment, and hinge moment were obtained at various angles of control deflection and angles of attack through a Mach number range of 0.6 to 1.18.

NACA RM L50L04

EFFECTS OF SEVERAL ARRANGEMENTS OF RECTANGULAR VORTEX GENERATORS ON THE STATIC-PRESSURE RISE THROUGH A SHORT 2:1 DIFFUSER. E. Floyd Valentine and Raymond B. Carroll. February 20, 1951. 35p. diagrs., photos. (NACA RM L50L04) (Declassified from Confidential, 8/31/54)

Several arrangements of simple rectangular noncambered vortex generators were investigated in a 2:1 area-ratio diffuser of length equal to the inlet diameter and having an initial boundary-layer thickness of 5 percent of the inlet diameter. Some arrangements actually reduced the diffuser static-pressure rise. The effect of one of the better vortex-generator arrangements was to increase the diffuser effectiveness by 30 percent making it equal to that of a diffuser of twice the length.

NACA RM L50L04a

PRESSURE DISTRIBUTIONS OVER A RETRACTED LEADING-EDGE SLAT ON A 40° SWEPTBACK WING AT MACH NUMBERS UP TO 0.9. Jones F. Cahill and Gale C. Oberndorfer. January 26, 1951. 36p. diagrs. (NACA RM L50L04a) (Declassified from Confidential, 8/31/54)

Pressure distributions over a retracted leading-edge slat on a 40° sweptback wing are presented for a series of angles of attack up to maximum lift at Mach numbers of 0.1, 0.4, 0.6, 0.7, 0.8, 0.85, and 0.9. These data were obtained in the Langley low-turbulence pressure tunnel at a constant Reynolds number of approximately 3×10^6. The Reynolds number was maintained approximately constant through the Mach number range by varying the stagnation pressure.

NACA RM L50L07

AN EXPERIMENTAL STUDY OF MODERATE AND HIGH SUBSONIC SPEEDS OF THE FLOW OVER AN UNSWEPT WING IN CONJUNCTION WITH A FUSELAGE. Richard T. Whitcomb. June 18, 1951. 35p. diagrs., photos. (NACA RM L50L07) (Declassified from Confidential, 8/31/54)

A relatively extensive study is presented of the pressure distributions, wake measurements, and tuft patterns obtained for an unswept, high-aspect-ratio, tapered wing, in conjunction with a fuselage, at Mach numbers up to 0.925.

NACA RM L50L12a

TABULATED PRESSURE COEFFICIENTS AND AERODYNAMIC CHARACTERISTICS MEASURED IN FLIGHT ON THE WING OF THE DOUGLAS D-558-I AIRPLANE THROUGHOUT THE NORMAL-FORCE-COEFFICIENT RANGE AT MACH NUMBERS OF 0.67, 0.74, 0.78, AND 0.82. Earl R. Keener, James R. Peele and Julia B. Woodbridge. January 29, 1951. 37p. diagrs., photos., 6 tabs. (NACA RM L50L12a) (Declassified from Confidential, 8/31/54)

Tabulated pressure coefficients and aerodynamic characteristics measured in flight on the right wing of the Douglas D-558-I airplane throughout the normal-force-coefficient range at Mach numbers of 0.67, 0.74, 0.78, and 0.82 are presented.

NACA RM L50L18

FLIGHT DETERMINATION OF THE DRAG AND PRESSURE RECOVERY OF AN NACA 1-40-250 NOSE INLET AT MACH NUMBERS FROM 0.9 TO 1.8. R. I. Sears and C. F. Merlet. February 28, 1951. 32p. diagrs., photos., 2 tabs. (NACA RM L50L18) (Declassified from Confidential, 8/31/54)

External-drag and pressure-recovery data are presented for the NACA 1-40-250 nose inlet. The tests were made using rocket-propelled models in free flight at Mach numbers from 0.9 to 1.8. The Reynolds number based on body diameter varied from 4 to 10×10^6.

NACA RM L50L28

ERROR IN AIRSPEED MEASUREMENT DUE TO STATIC-PRESSURE FIELD AHEAD OF THE WING TIP OF A SWEPT-WING AIRPLANE MODEL AT TRANSONIC SPEEDS. Edward C. B. Danforth and Thomas C. O'Bryan. March 1, 1951. 16p. diagrs., photo. (NACA RM L50L28) (Declassified from Confidential, 8/31/54)

Contains measurements of static pressure taken at a distance of 1 tip chord ahead of the wing tip of a model of a swept-wing fighter airplane for the condition of near zero lift. The measurements made by means of the NACA wing-flow method cover a range of Mach numbers from 0.7 to 1.08. The influence of the complete airplane configuration on the static pressure is shown, together with the influences of the wing and fuselage taken separately. Comparisons with the linear theory are made where possible.

NACA RM L51A16

A COMPARISON OF TWO TECHNIQUES UTILIZING ROCKET-PROPELLED VEHICLES FOR THE DETERMINATION OF THE DAMPING-IN-ROLL DERIVATIVE. David G. Stone and Carl A. Sandahl. May 3, 1951. 17p. diagrs., photos. (NACA RM L51A16) (Declassified from Confidential, 8/31/54)

Rocket-powered flight investigations have been conducted for the purposes of comparing damping-in-roll derivatives as obtained from the torque-nozzle technique and the sting-mount technique. The agreement in damping-in-roll values obtained by the two techniques was good and showed the transonic rolling behavior of wings to be more affected by wing-dropping characteristics than by damping in roll.

NACA RM L51A17

APPLICATION OF THEODORSEN'S PROPELLER THEORY TO THE CALCULATION OF THE PERFORMANCE OF DUAL-ROTATING PROPELLERS. Jean Gilman, Jr. March 15, 1951. 31p. diagrs. (NACA RM L51A17) (Declassified from Confidential, 8/31/54)

Theodorsen's propeller theory is used to calculate the performance of dual-rotating propellers having nonideal load distributions. The ratio of the spinner radius to the propeller radius is shown to have a significant effect in evaluating the mass coefficient used in making calculations for either performance or design work. Sample performance calculations are made and the results are compared with experimental results for flight Mach numbers varying from 0.53 to 0.90.

NACA RM L51A18

CORRELATION OF SUPERSONIC CONVECTIVE HEAT-TRANSFER COEFFICIENTS FROM MEASUREMENTS OF THE SKIN TEMPERATURE OF A PARABOLIC BODY OF REVOLUTION (NACA RM-10). Leo T. Chauvin and Carlos A. deMoraes. March 7, 1951. 39p. diagrs., photo. 2 tabs. (NACA RM L51A18) (Declassified from Confidential, 8/31/54)

Free-flight tests at supersonic speeds have been made to determine the local convective heat-transfer coefficients, evaluated from measured skin temperatures along the body of a rocket-propelled fin-stabilized parabolic body of revolution. The Mach number range covered was 1.02 to 2.48 and the Reynolds number range was 3.18×10^6 to 163.85×10^6. The experimental values are compared with the results obtained from the V-2 research missile and also with several equations for heat transfer in a turbulent boundary layer.

NACA RM L51A19

THE TORSIONAL DEFLECTIONS OF SEVERAL PROPELLERS UNDER OPERATING CONDITIONS. W. H. Gray and A. E. Allis. June 1951. 56p. diagrs., photos., tab. (NACA RM L51A19) (Declassified from Confidential, 8/31/54)

Presents measured and computed torsional deflections of the family of constant-chord solid aluminum-alloy propeller blades used in a concurrent investigation of blade-section pressure distributions. The deflections were not negligible and varied with blade design and operating condition. It was concluded that blade torsional deflection may be computed with sufficient accuracy and should be considered in the design of thin propeller blades.

NACA RM L51A23

FLIGHT DETERMINATION OF THE EFFECTS OF WING VORTEX GENERATORS ON THE AERODYNAMIC CHARACTERISTICS OF THE DOUGLAS D-558-I AIRPLANE. De E. Beeler, Donald R. Bellman and John H. Griffith. August 14, 1951. 23p. diagrs., photos., tab. (NACA RM L51A23) (Declassified from Confidential, 8/31/54)

Tests were made to determine the effects of wing vortex generators on the handling and buffeting characteristics of the Douglas D-558-I airplane. Measurements of the chordwise pressure distribution over one section of the wing, the total-head losses in a portion of the wing wake, the total airplane drag, and the buffeting and handling characteristics were made with the basic configuration and with vortex generators of an arbitrary size, shape, and location installed on the wing.

NACA RM L51B12

AVERAGE SKIN-FRICTION COEFFICIENTS FROM BOUNDARY-LAYER MEASUREMENTS IN FLIGHT ON A PARABOLIC BODY OF REVOLUTION (NACA RM-10) AT SUPERSONIC SPEEDS AND AT LARGE REYNOLDS NUMBERS. Charles B. Rumsey and J. Dan Loposer. March 7, 1951. 33p. diagrs., photo. (NACA RM L51B12) (Declassified from Confidential, 8/31/54)

Boundary-layer measurements were made at two stations on a rocket-powered, fin-stabilized, parabolic body of revolution of fineness ratio 12.2. Skin-friction coefficients were determined over a Mach number range from 1.5 to 3.4 and over the Reynolds number range, based on body length to the measurement station, from 42×10^6 to 160×10^6. Theoretical turbulent skin-friction coefficients for a flat plate, with heat transfer, are also shown.

NACA RM L51B13

THE EFFECT OF END PLATES, END STRUTS, AND DEPTH OF SUBMERGENCE ON THE CHARACTERISTICS OF A HYDROFOIL. Kenneth L. Wadlin, Rudolph E. Fontana and Charles L. Shuford, Jr. April 12, 1951. 84p. diagrs., photos. (NACA RM L51B13) (Declassified from Confidential, 8/31/54)

An investigation was made in Langley tank No. 2, at subcavitation speeds, of the effect of end plates and end-mounted struts. Only small improvements might be expected in the maximum lift-drag ratios by the addition of end plates. End struts reduced the lift-drag ratio attainable with a single strut. The effect of end plates and end struts on effective aspect ratio was in good agreement with theory. An approximate theoretical solution of the effect of depth on the lift of a hydrofoil was developed.

NACA RM L51B28

NOTE ON FLUTTER OF A 60° DELTA WING ENCOUNTERED AT LOW-SUPERSONIC SPEEDS DURING THE FLIGHT OF A ROCKET-PROPELLED MODEL. William T. Lauten, Jr. and Grady L. Mitcham. May 14, 1951. 21p. diagrs., photos., 5 tabs. (NACA RM L51B28) (Declassified from Confidential, 8/31/54)

Results of the flight test of a rocket-powered model of a delta-wing (60° sweepback) body configuration indicated a wing flutter at a Mach number of 1.11 and a subsequent structural failure of a Mach number of 0.99. Sections of the flight time history and the ground-test results of a duplicate wing for natural frequencies of vibration, the structural influence coefficients, and the mass, moment of inertia, and center of gravity of streamwise strips of the wing are presented.

NACA RM L51C07

EFFECT OF A DEFLECTABLE WING-TIP CONTROL ON THE LOW-SPEED LATERAL AND LONGITUDINAL CHARACTERISTICS OF A LARGE-SCALE WING WITH THE LEADING EDGE SWEPT BACK 47.5°. Roy H. Lange and Marvin P. Fink. April 26, 1951. 41p. diagrs., photo., 2 tabs. (NACA RM L51C07) (Declassified from Confidential, 8/31/54)

Results are presented of an investigation in the Langley full-scale tunnel of the effect of a 20-percent-semispan deflectable wing-tip control on the low-speed lateral and longitudinal characteristics of a wing with the leading edge swept back 47.5° and circular-arc-airfoil sections. The basic wing configurations, the wing with drooped-nose flaps deflected 40°, and the wing with drooped-nose and semispan plain flaps deflected 40° were investigated throughout. All the data are presented for a Reynolds number of 4.3×10^6 and a Mach number of 0.07.

NACA RM L51C26

AERODYNAMIC CHARACTERISTICS OF TAPERED WINGS HAVING ASPECT RATIOS OF 4, 6, AND 8, QUARTER-CHORD LINES SWEPT BACK 45°, AND NACA 63_1A012 AIRFOIL SECTIONS. TRANSONIC-BUMP METHOD. Edward C. Polhamus and Thomas J. King, Jr. June 13, 1951. 23p. diagrs., photos., 2 tabs. (NACA RM L51C26) (Declassified from Confidential, 8/31/54)

This paper presents the results of an investigation by the transonic-bump method of wings of aspect ratios 8, 6, and 4 with the quarter-chord lines swept back 45°, and having NACA 63_1A012 airfoil sections, parallel to the plane of symmetry. Lift, drag, pitching-moment, and root bending-moment characteristics are presented for the Mach number range from 0.70 to 1.15.

NACA RM L51D18

FLIGHT INVESTIGATION OF THE LONGITUDINAL STABILITY AND CONTROL CHARACTERISTICS OF THE DOUGLAS D-558-I AIRPLANE (BUAERO NO 37972) AT MACH NUMBERS UP TO 0.89. Melvin Sadoff, William S. Roden and John M. Eggleston. June 1951. 26p. diagrs., photos., tab. (NACA RM L51D18) (Declassified from Confidential, 8/31/54)

Results and analysis pertaining to the longitudinal stability and control characteristics of the Douglas D-558-I airplane (BuAero No. 37972) are presented. The results indicated that large and rapid changes in elevator deflection and force were required for balance above a Mach number of 0.84. Analysis indicated that a major part of these changes was due to a loss in elevator effectiveness. A large increase in the apparent stick-fixed stability parameter $d\delta_e/dC_N$ was also noted due to a loss in elevator effectiveness combined with an increase in airplane stability.

NACA RM L51D19

EFFECTS OF SPANWISE THICKNESS VARIATION ON THE AERODYNAMIC CHARACTERISTICS OF 35° AND 45° SWEPTBACK WINGS OF ASPECT RATIO 6. TRANSONIC-BUMP METHOD. William D. Morrison, Jr. and Paul G. Fournier. July 1951. 38p. diagrs., photo. (NACA RM L51D19) (Declassified from Confidential, 8/31/54)

The effects of taper-in-thickness on the aerodynamic characteristics of wings having 35° and 45° of sweepback, aspect ratio 6, and taper ratio 0.6 have been determined by the transonic-bump technique over a Mach number range from 0.6 to 1.14. The results of this investigation are compared with those obtained from wings of the same plan form but of various constant section thickness ratios. Theoretical subsonic and low supersonic calculations of lift-curve slope, aerodynamic center, and lateral center-of-pressure location were determined.

NACA RM L51D23

THEORETICAL INVESTIGATION OF AN AUTOMATIC CONTROL SYSTEM WITH PRIMARY SENSITIVITY TO NORMAL ACCELERATIONS AS USED TO CONTROL A SUPERSONIC CANARD MISSILE CONFIGURATION. Ernest C. Seaberg and Earl F. Smith. July 1951. 48p. diagrs., photo., 3 tabs. (NACA RM L51D23) (Declassified from Confidential, 8/31/54)

An analysis has been made to determine the possibilities of using an autopilot primarily sensitive to linear accelerations for longitudinal control of a specific supersonic canard airframe. Essentially, the control system combines the use of a linear accelerometer and an integrating servomotor to obtain desired normal accelerations of the missile. The analysis is based largely on comparisons of normal acceleration transient responses obtained for various conditions of Mach number, altitude, static margin, and rate-of-pitch feedback. Because the acceleration control system has no directional space reference of its own, it is believed that its primary usefulness is in conjunction with a homing seeker or with a guidance system which will provide a directional space reference.

NACA RM L51D24

PRESSURE-DISTRIBUTION MEASUREMENTS OVER A 45° SWEPTBACK WING AT TRANSONIC SPEEDS BY THE NACA WING-FLOW METHOD. Edward C. B. Danforth and Thomas C. O'Bryan. June 1951. 42p. diagrs., photos. (NACA RM L51D24) (Declassified from Confidential, 8/31/54)

Pressure distributions have been obtained over the chord of an untapered, 45° sweptback wing model of 3.5 aspect ratio with 2-inch-chord NACA 65-210 airfoil sections normal to the leading edge at four stations along the span. The measurements, made by the NACA wing-flow method, covered Mach numbers from 0.7 to 1.1 and angles of attack from -1° to 4° at a nominal Reynolds number of 0.6×10^6 based on the chord. Comparisons are made with force tests and theory where possible.

NACA RM L51D24a

WING-FLOW INVESTIGATION OF THE CHARACTERISTICS OF SEVEN UNSWEPT, UNTAPERED AIRFOILS OF ASPECT RATIO 8.0. Harold L. Crane and James J. Adams. June 13, 1951. 54p. diagrs., photo. (NACA RM L51D24a) (Declassified from Confidential, 8/31/54)

Measurements were made of normal force, chord force, and pitching moment at angles of attack from -6° to 14° and Mach numbers of 0.65 to 1.08, for seven airfoil sections. The sections included were NACA 65-010, 65-210, 836D110, 847B110, a 10-percent-thick airfoil with 3-to-1 elliptical nose faired into a straight-sided afterbody, an airfoil having the same thickness distribution and a reflex-camber line obtained by subtracting an NACA 240 from an NACA 420 mean line, and an airfoil having the thickness distribution of the NACA 65-010 and the reflex-camber line.

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